JOURNAL OF THE BIOLOGICAL PHOTOGRAPHIC ASSOCIATION

INDEX TO VOLUME 27 — 1959

A

About Films and Emulsions in Phase Contrast Cinephotomicrography 146

Agar Gel Plates, Photographing Precipitation Bands in 133

Albright, Robert F. 73

AMA Awards for Photography 159

Applications of Autoradiography in Biological Research 1

Association News 42-84-126-166

Autoradiography in Biological Research, Applications of 1

Autoradiography of Electrophoretic Starch Gels Containing Fe^{59} 49

Award, Louis Schmidt 160

B

Biological Research, Applications of Autoradiography in 1

Bohart, G. E. 139

Book Reviews 41-124-164

Budget-Minded Method of Producing 2x2 Black-and-White Projection Slides, A. 79

Burton, M.D., Alex L. 146

C

Cinephotomicrography, About Films and Emulsions in Phase Contrast 146

Coleman, E. J. 1

Contributing Members 48-92-132-176

D

Densichron and Gray Scale Chips Supplied with the Densichron Reflection Unit, Film Characteristic Curves Using the 19

Dockum 1

E

Editing, Smooth Techniques in 16mm Film 113

Editorial Board of Medical and Biological Illustration (British) 39

Education and Research, Photography, A Medium For 69

Electrophoretic Starch Gels Containing Fe^{59}, Autoradiography of 49

F

Fellows of the Association..Inside Back Cover

Fellowship Procedure....Inside Back Cover

Fe^{59}, Autoradiography of Electrophoretic Starch Gels Containing 49

Film Characteristic Curves Using the Densichron and Gray Scale Chips Supplied With the Densichron Unit..... 19

First International Congress on Medical Photography and Cinemaphotography, Cologne 1960

Fischler, B.S., M.A., Herbert A. 113

G

Gibson, D. A. 151

Gibson, H. Lou 93

Gott, Preston F. 19

Gray Scale Chips Supplied with the Densichron Reflection Unit, Film Characteristic Curves Using the Densichron and 19

H

Hart, Leonard M. 61

Hilliard, Allen 27

Hisaoka, Kenneth K. 156

I

Ikenberg, Maria 69

In Memoriam 68

Insects Close-Up, Photographing 139

J

Jackson Ross 49-133

L

Lantern Slides, A Method of Duplicating 73

Layouts for Medical Photography 93

Levin, Albert 160

Low Power Stereoscopic Photomicrography 119

M

Marchese, Anthony L. 156

Medical and Biological Illustration 38-60-112-175

Method for Duplicating Lantern Slides, A 73

Miller, Ervin W. 33

Morrison, W. E. 65

Motion Pictures, Pre-Print Preparation of 16mm 27

Mott, Phillip H. 119

N

New Members 72

New Products 44, 87, 127, 169

Non-Medical Photography in a Medical Institution 33

Nye, W. P. 139

P

Pedigo, Louis 69

Peterson, John E. 53

Phase Contrast Cinephotomicrography, About Films and Emulsions in 146

Phase Contrast Microscope in Photographing Tissues Stained With Standard Stains, The Use of 156

Photographing Precipitation Bands in Agar Gel Plates 133

Photography, A Medium for Education and Research 69

Photography in a Medical Institution, Non Medical 33

Photography Through the Stereoscopic Microscope 53

Photographing Insects Close-Up..... 139

Picture Story, 29th Annual Meeting.... 162

Portable Sound-Proof Booth 61

Precipitation Bands in Agar Gel Plates, Photographing 133

Pre-Print Preparation of 16mm Motion Pictures 27

R

Recording Fluorescence Phenomena Under Ultra-Violet Radiation 151

Reindl, Frank J. 61-69

Remarks of Appreciation, by Dr. Holinger 161

S

Serial Motion Pictures: A Method for Behavioral Studies in Psychopharmacology, Simultaneous Projection of.. 149

Simultaneous Projection of Serial Motion Pictures: A Method For Behavioral Studies in Psychopharmacology 149

Slides, A Budget-Minded Method of Producing 2x2 Black-and-White Projection 79

Smooth Transition Techniques in 16mm Film Editing 113

Sound-Proof Booth, Portable 61

Starch Gels Containing Fe^{59}, Autoradiography of Electrophoretic 49

Stereoscopic Microscope, Photography Through 53

Stereoscopic Photomicrography, Low Power 119

Sustaining Members .....Inside Back Cover

T

Taylor, C. P. 79

Twenty-eighth Annual Meeting— Picture Story 82

U

Ultra-Violet Radiation, Recording Fluorescence Phenomena Under 151

Use of the Phase Contrast, Microscope in Photographing Tissues Stained With Standard Stains 156

V

Vidicon or 16mm Movie, An Intra-Oral Camera 65

Vogt, G. S. 1

W

Whittier, John R. 149

1

JOURNAL BPA OF THE

Biological Photographic Association

Dedicated to the Science, Techniques and Applications Pertaining to the Photography of All Things Which Live or Which Have Lived

QUARTERLY OF THE BIOLOGICAL PHOTOGRAPHIC ASSOCIATION, INC.

Volume 27, Number 1 February 1959

JOURNAL *of the* BIOLOGICAL PHOTOGRAPHIC ASSOCIATION

EDITOR

EDITOR . . . . . LEO C. MASSOPUST

ASSOC. EDITOR . . . . . STANLEY WEINREB, Ph.D.

Marquette University
School of Medicine

Milwaukee 3, Wisconsin

EDITORIAL POLICY

Manuscripts should be sent to the Editor in legible form on 8½" x 11" paper, preferably typewritten, double spaced, with 1¼" margins on both edges as well as top and bottom.

Tables should be on separate sheets, each with self explanatory captions.

Reference notations in the text should be written as superscripts. Do not place in parenthesis. References should be on sheets separate from the text, numbered consecutively in the order of their appearance in the manuscript. Journal references should include: Author(s), title of article, volume number, page number(s), month and year. Book references: Author(s), title of book, edition, page number(s), publisher, year. Double space lines, triple space between references, 1¼" margins.

Illustrations should accompany the manuscript, preferably unmounted. They must not be larger than 14" nor smaller than 4" in maximum dimension, and should be properly proportioned to fit single column, double column or full page of the Journal. Identify each illustration on its back in soft blue pencil, giving title of paper, senior author and Fig. No. only. Legends should be on a separate sheet and each identified by Fig. No. matching its illustration. Double space lines, triple space between legends, 1¼" margins.

The editors reserve the right to reject manuscripts considered unsuitable. Major alterations of accepted manuscripts will not be made without permission of the senior author.

Special Note: If you have an idea or technique of importance to biological photography and need assistance in preparing the manuscript, write Editor.

OFFICERS OF THE ASSOCIATION

President — Leo C. Massopust, Sr., FBPA, Marquette University School of Medicine, Milwaukee, Wis.

Vice President — Verlin Y. Yamamoto, FBPA, Medical Illustration Service, Veterans Administration Center, Des Moines 9, Iowa

Secretary — Jane H. Waters, FBPA, Grand Central P.O., Box No. 1668, New York 17, N.Y.

Treasurer — Albert Levin, FBPA, University of Pittsburgh, Health Professions Bldg., A-V Photo Service, Pittsburgh 13, Pa.

Opinions expressed by authors are not necessarily those of the Biological Photographic Association.
Copyright, 1959, by Biological Photographic Association, Inc.

OFFICIAL PUBLICATION OF THE BIOLOGICAL PHOTOGRAPHIC ASSOCIATION, INC.

Published at 733 North Van Buren Street, Milwaukee 2, Wisconsin. Editorial office: Box 1668 Grand Central P.O., New York 17, N.Y. Entered at the Post Office, Milwaukee, Wisconsin, under the act of March 3, 1879. Subscription price $9.00 per volume; foreign $9.50. Single copies $2.25 in the U.S.A.; foreign $2.40 in U.S.A. funds.

Journal of the Biological Photographic Association Vol. 27, No. 1 February, 1959

Applications of Autoradiography in Biological Research*

N. L. DOCKUM, G. S. VOGT and E. J. COLEMAN

Biology Operation, Hanford Laboratories
General Electric Company, Richland, Washington

THE word "autoradiography" designates the technique utilized to produce an image on a photographic plate or film by radioactive material, and the term "autoradiogram" designates the result of this exposure to radiation.

Investigators are interested in identifying the radioactive compounds they are working with and knowing whether or not they are alpha or beta emitting radioisotopes. Whether these compounds exist as particulates or in solution, their localization in the tissues and the changes apparent from the particular radioisotopes are of importance.

The first portion of this discussion will deal with the positive identification of alpha and beta emitting particulates and their measurement. The second portion will give methods for localization of radioisotopes within tissue. The third portion will cover the detection of an alpha emitter (Pu^{239}) in accidentally contaminated personnel. The final portion is a suggested method for illustrating autoradiographic reports.

Part I. Characterization of Radioactive Particles

Droplets of the sample are spread on a clean microscope slide and dried. After chromium shadowing at a thirty degree angle, the sample is examined under the optical microscope, and areas which include particles of interest are recorded by stage micrometer readings and photomicrography. In a darkroom, using a Series I safelight filter, the specimen is then covered by a 5 μ NTB stripping film emulsion by floating the emulsion on the specimen. The slide with the covering of film is placed in a light tight box with a dessicant and exposed for a suitable length of time at 3° C (four hours to seven days). The emulsion of choice in this instance is limited by the developed grain size, which is 0.2 μ in the NTB emulsion and from 2-3 μ in the X-ray emulsion. The emulsion containing the smaller developed grains simplifies recognition of the particles that are radioactive. The exposed slides are allowed to warm to room temperature, developed for 5 minutes in D-19 developer, washed, fixed, dehydrated and cleared, and a coverslip mounted over the emulsion. The previously selected areas are examined and photographed again so that a comparison of the individual particles and their autoradiogram may be made.

Following shadowing, the size of the particles may be determined by simple computation, after measuring the width

* Work performed under Contract No. W-31-109-Eng-52 between the Atomic Energy Commission and General Electric Company.

and length of the shadow with a known angle of shadowing. It is possible to obtain additional information on the specific radioactive particle size by superimposing the negative of the autoradiogram over the negative of the original photomicrograph. This causes the image of the shadowed particle to stand out from the center of the white area of the negative, which is the alpha track area in the case of the alpha emitter or the spot-diameter in the case of the beta emitter (1).

Several observations may be made from the photomicrographs and the autoradiograms of the radioactive particles. In the original photomicrograph it is not possible to identify an individual particle as one that is radioactive. After these particles have been autoradiographed the alpha tracks arising from a central point indicate that the individual particle is radioactive and an alpha emitter.

When a circular group of grains in the emulsion appears as a spot-diameter darkening, the particle is radioactive and a beta emitter. Thus, the two types of radioactive particles may be identified. Particles that are non-radioactive cause neither an alpha star nor a spot-diameter to appear on the emulsion directly over the particle. Consequently, a differential count can be made comparing the number of radioactive particles to the number that are non-radioactive.

Figure 1 is a photomicrograph of chromium shadowed particles prior to autoradiography. Figure 2 is a photomicrograph of the same area of the chromium shadowed autoradiogram showing the alpha tracks emerging from central points, which are the radioactive particles marked "A". Non-radioactive particles are designated "B". By placing the negative of the autoradiogram on an illuminated viewer and superimposing the negative of the chromium shadowed particles over it, the radioactive particles are easily seen and can be measured with a micrometer scale taken at the same magnification as the two comparison photomicrographs.

Beta emitters are characterized by an increased grain density that is circular in appearance (spot-diameters) around the radioactive particles, (Figures 3 and 4). Particles labelled "A" are radioactive; particles labelled "B" are not. Relatively few grains arise from the smaller particles. This technique is suggested for measurement of the size of alpha or beta emitting radioactive particles which are to be used for inhalation or injection experiments with laboratory animals. The method is applicable where the minimum particle size to be measured is above 0.1 μ or within the observable limits of the optical microscope. Smaller radioactive particles may adhere to larger non-radioactive particles.

Following intravenous injection or inhalation of either alpha or beta emitting radioactive particles, it is possible to determine their pattern of distribution in the tissues of the body by autoradiography (2). Figure 5 is an autoradiogram of mouse lung tissue showing the characteristic "star" alpha track pattern in large phagocytes, following PuO_2 particle administration. Figure 6 is the tissue section adjacent to the autoradiogram stained to show detail of the cellular elements containing the alpha emitting particles. By taking the adjacent section a comparison of the tissue section and the autoradiogram is simplified. The same general method would be applicable in the case of an analysis of radioactive particles that might appear from

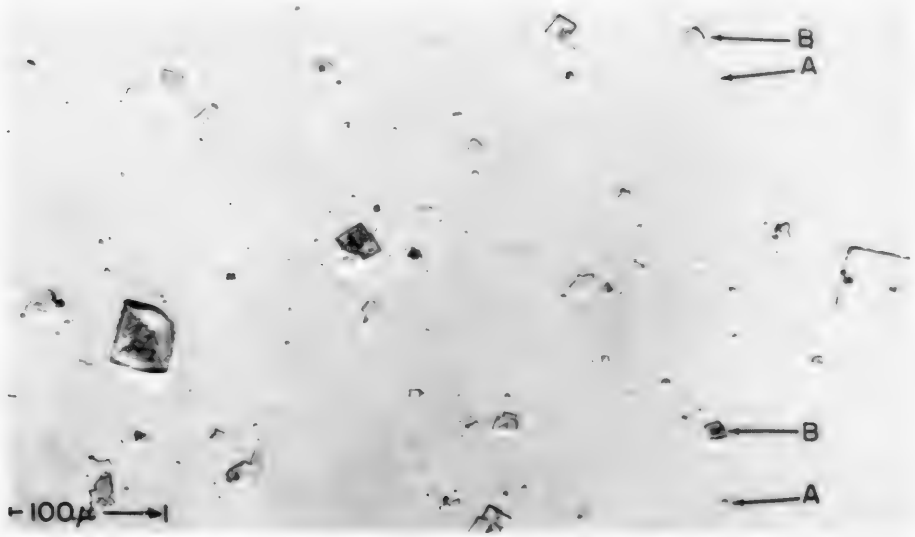


Figure 1. Chromium shadowed plutonium^{239} dioxide particles prior to autoradiography. Shadows appear as white areas below the particles. Chrome shadowed at 30°.

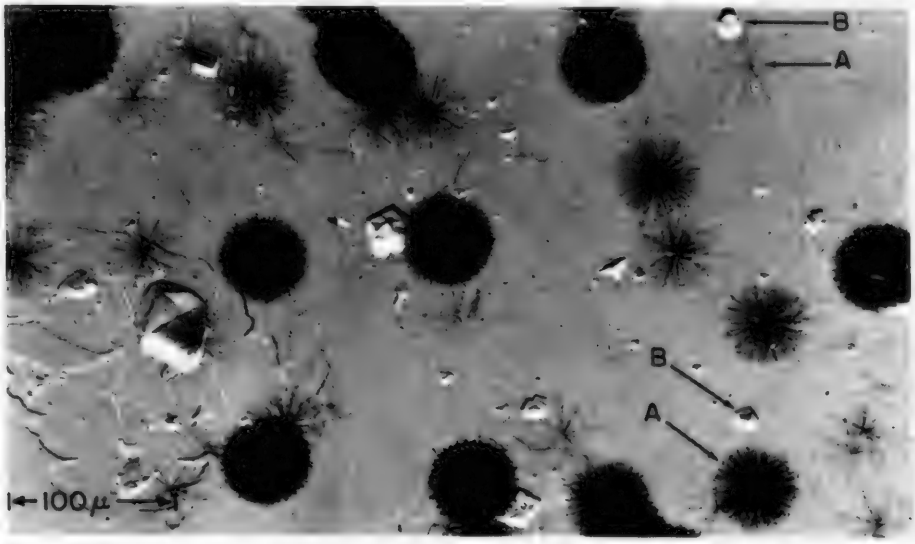


Figure 2. Autoradiogram of chromium shadowed plutonium^{239} dioxide particles shown in Figure 1. Note the "stars" of the alpha tracks arising from alpha emitting particles "A". No stars arise from nonradioactive particles "B". Differentiation of radioactive particles is possible

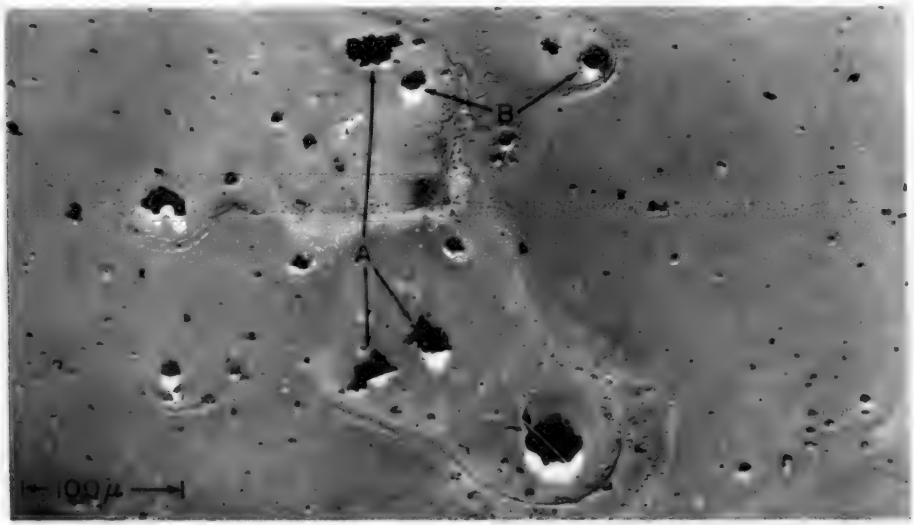


Figure 3. Chromium shadowed particles from a suspension containing ruthenium^{106} dioxide. Particles shadowed at 30° angle.

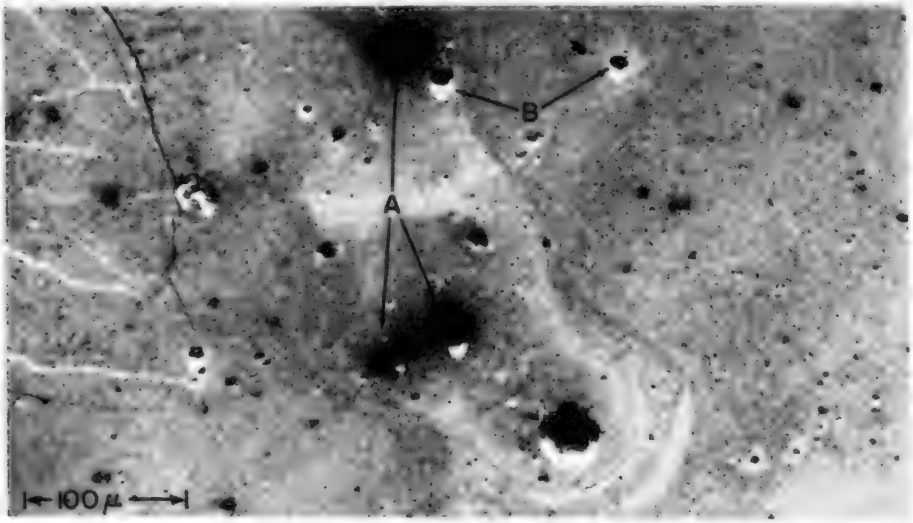


Figure 4. Autoradiogram of chromium shadowed ruthenium^{106} dioxide particles. Beta grain darkening in emulsion indicates position of radioactive particles. Compare with Figure 3. Particles "A" are radioactive, "B" are not.

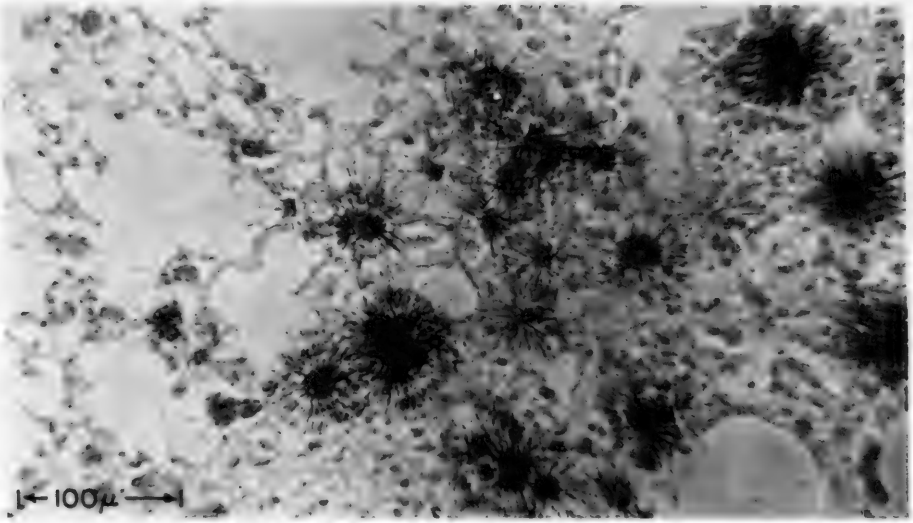


Figure 5. Autoradiogram of tissue section of lung adjacent to Figure 6 showing alpha activity (stars) from plutonium^{239} dioxide particles within large phagocytes.

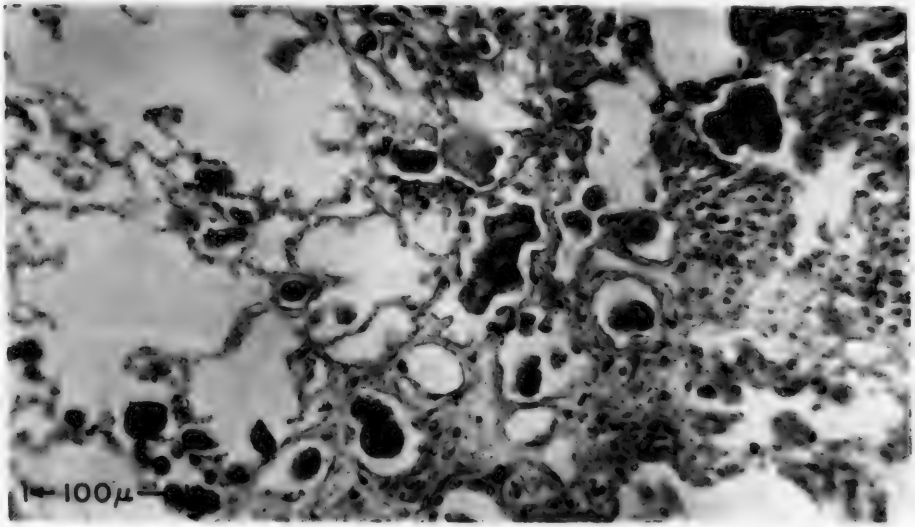


Figure 6. Large confluent phagocytes in mouse lung obtained one year after intratracheal injection of 0.06 μc of plutonium^{239} dioxide.

Figure 7. Autoradiogram of rat ovary twenty-four hours after administration of 2.5 μc of P^{32} per gram of rat. Concentrations of P^{32} appear over cellular elements lining the follicular cavity, surrounding the ova and in some of the *corpora lutea*. (40X)

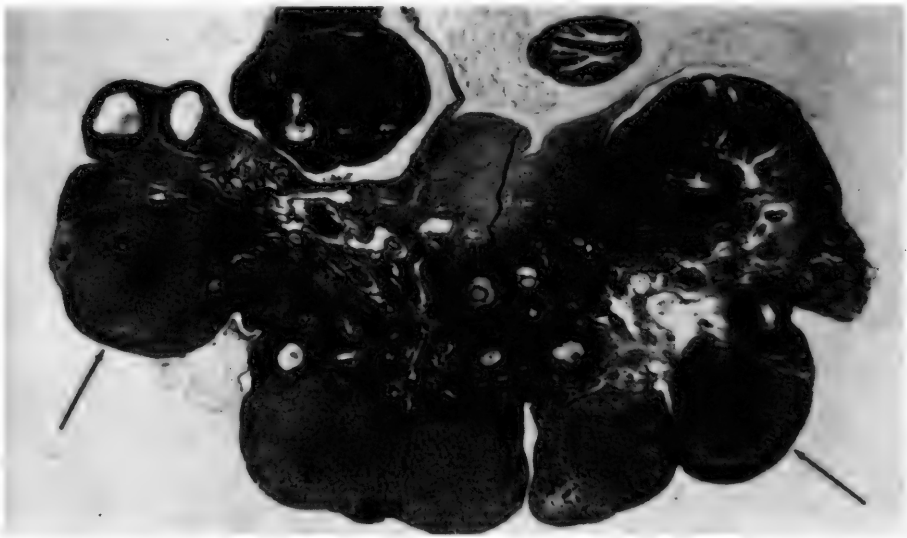


Figure 8. Stained (adjacent to Figure 7) histological section of rat ovary twenty-four hours after administration of 2.5 μc of P^{32} per gram of rat. Three developing ova are seen in central portion. (40X

fallout, or water samples that were contaminated with radioactive particles.

Part II. Methods for Localization of Radioisotopes Within Tissue

A. Detection of P^{32} in the ovary and intestine of rats:

Rats administered 2.5 μc of P^{32} per gram of body weight were sacrificed twenty-four hours after administration. The P^{32} was administered as $Na_2HP^{32}O_4$ in solution, by intraperitoneal doses. Radiophosphorus is a weak beta emitter.

A rapid and sensitive survey method (3) for observing generalized areas of localization of P^{32} in the ovary and intestine involves the selection of single layered emulsion No-Screen X-ray film, which in this case was 25 μ thick, mounted on 1 inch $\times$ 3 inch glass slides. The thickness of the emulsion precludes a detailed autoradiographic analysis, but is adequate for fast survey work. The advantages of this film are the increased sensitivity of the large grained (3-5 μ) emulsion and corresponding positive reaction to small quantities of radiation, coupled with the decreased exposure time necessary to produce a satisfactory image. The disadvantages include the large grain size, which makes cellular autoradiography impossible and the extreme thickness of the emulsion which makes it impossible to have the tissue section and the grains of the emulsion in focus at the same time when illustrating the material. The use of low power objective coupled with a long bellows extension for photomicrography is necessary. Processing is similar to the other films except that X-ray developer is used.

Figure 7 is an autoradiogram of rat ovary 24 hours following intraperitoneal injection of P^{32}. Beta grain density is increased in the area of the developing ova and the corpora lutea. This autoradiogram may be compared with the adjacent hemotoxylin and eosin stained section shown in Figure 8.

A similar autoradiogram of the gut of a rat following intramuscular dose of 0.5 μc of P^{32} per gram of rat is shown in Figure 9. The grain density of the X-ray film is greater over a specific area of the epithelium and may be compared with the H. & E. stained section, Figure 10, for cellular detail (4).

B. Detection of Pu^{239} in rat testis:

An example of the autoradiographic technique for an alpha emitter such as Pu^{239} in the testis of a rat may be seen at two and twelve week intervals following intravenous administration of 0.025 μc of plutonium per gram of rat, in a citrate buffer at a pH of 5.0. Figure 11, the autoradiogram, shows diffuse alpha tracks over all areas of the tissue; tissue detail at the two week interval may be seen in Figure 12. Contrasting the early diffuse stage with the late stage, as in Figure 13, the autoradiogram at the 12 week stage, and the matching histological section, Figure 14, shows that the plutonium tends to be aggregated in cells in the interstitial tissue and approaches a point source of radiation (a particle type reaction). Thus there is a relatively greater number of alpha tracks per unit volume of tissue.

C. Detection and quantitation, Ru^{106} particles in lung tissue:

A method for the quantitation of radioactive material in individual particles which have a strong beta emission is outlined (5). Radioruthenium was used because of its presence in the spectrum of products formed in the nuclear fission of uranium and because it is a beta emitter. The measurement of the radiation dose rate from a single

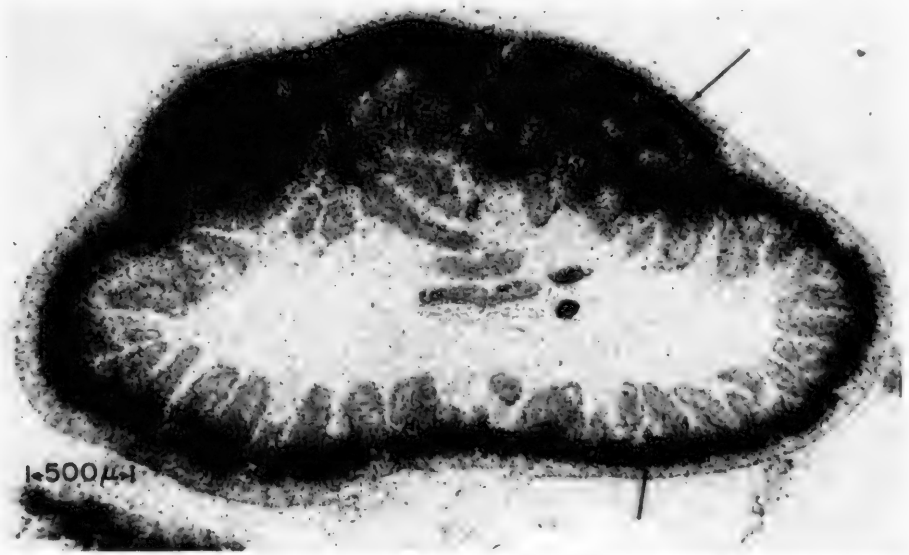


Figure 9. Autoradiogram of control rat intestine showing localization of P^{32} two hours after an intramuscular dose of 0.5 μc per gram of rat. Radioactivity concentrated in basal portion of villi and in lymphoid areas.

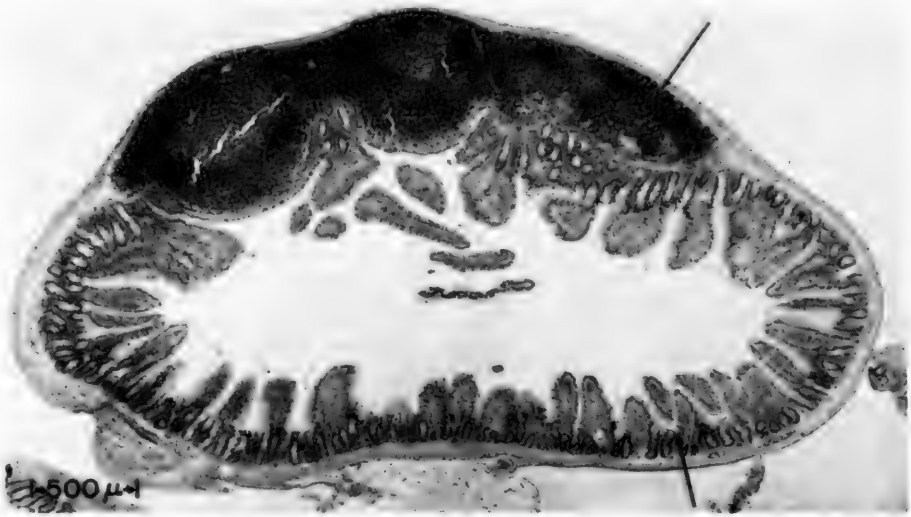


Figure 10. Hematoxylin and eosin stained section adjacent to that shown in Figure 9 for cytological comparison purposes.

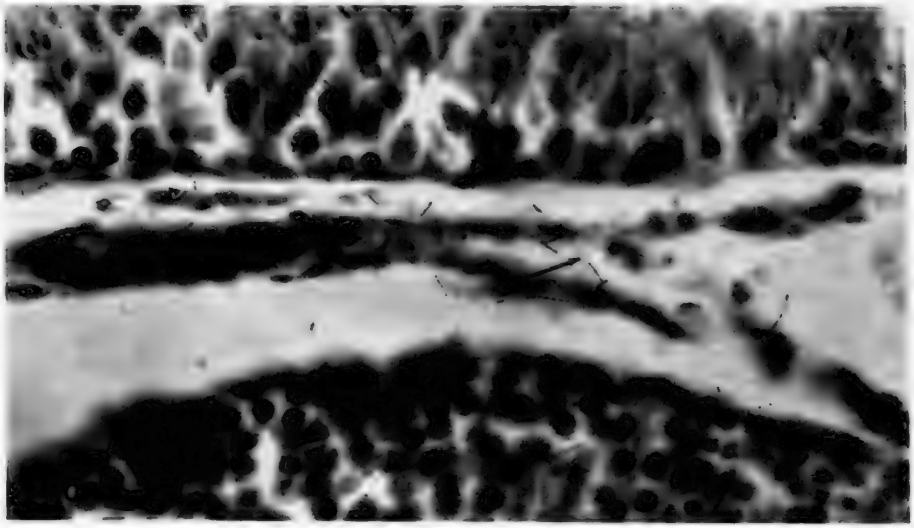


Figure 11. Autoradiogram of plutonium^{239} in citrate buffer at a pH of 5.0. Note diffuse distribution of Alpha tracks two weeks following intravenous administration in rat testis. Dose was 0.025 μc per gram of rat.

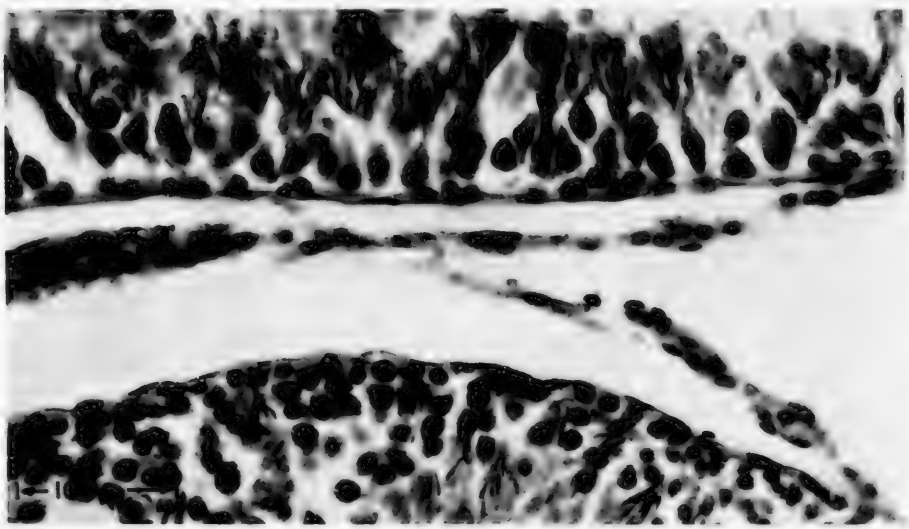


Figure 12. Tissue section of rat testis adjacent to Figure 11 showing detail of tubules.

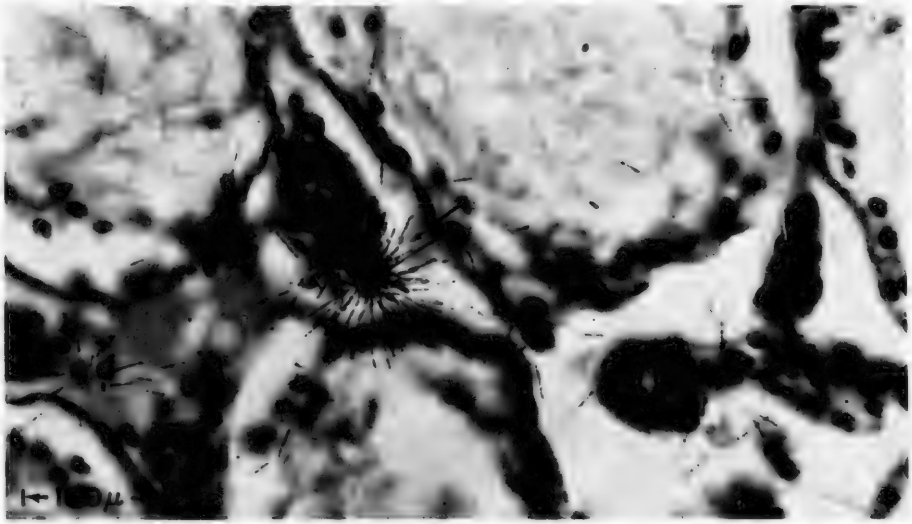


Figure 13. Autoradiogram of plutonium^{239} in citrate buffer at a pH of 5.0 twelve weeks following intravenous administration to rat. Note aggregation of alpha tracks in interstitial cells approaching appearance of point source contamination.

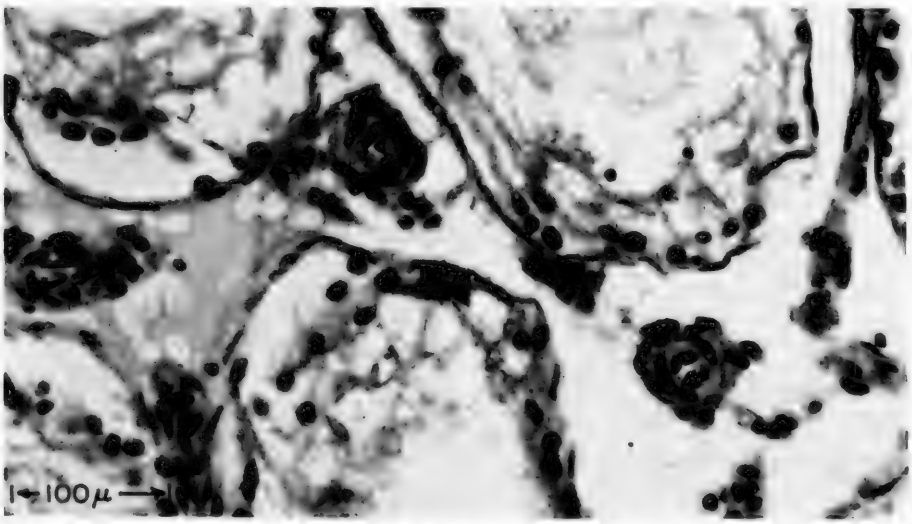


Figure 14. Hematoxylin and eosin stained section adjacent to that of Figure 13. This section and Figure 12 are the same magnification for comparison purposes of relative tubule size. Dose was .0025 μc per gram of rat.

particle in the presence of several others is often desirable. The typical reaction of the NTB emulsion to ruthenium di oxide in an insoluble form (particles) is the formation of an emulsion grain structure called a spot diameter darken ing. The limits of the increased grain density are well defined. A diffuse grain darkening with indefinite peripheral lim its is encountered when the ruthenium is in the form of a soluble salt.

Lung tissue, bearing the radioactive ruthenium dioxide particles, ranging in size from 0.5 to 0.8 μ had been fixed in 70 per cent ethyl alcohol, cleared in benzene, imbedded in 62-64° C Tissue mat, blocked and cut at 5 μ thickness. Sections were measured on a mica win dow counter for ruthenium dioxide con tent. The sections were floated on distilled water and attached to an Eastman Ko dak NTB autoradiographic emulsion of 10 μ thickness. A one micron protective coating prevented abrasions of the emul sion. Exposure of the sections was made for 72 hours at 3° C in a light tight box containing Drierite. After the slides had warmed to room temperature, the paraffin was removed from the tissue preparations by processing for 5 minutes in xylene, 5 minutes in Cellosolve and washing for 5 minutes in distilled water.

The autoradiographic emulsion was developed by controlled processing at 18° C in Eastman D-19 developer for 5 minutes, washed in distilled water and allowed to fix for 30 minutes in Kodak liquid X-ray fixer. The preparations were dehydrated and subsequently cov ered by Permount and a coverslip.

The activity of a single particle was taken as proportional to the diameter of the darkened area of the emulsion. If a number of particles were present on a single slide, the total counting rate was compared with the sum of all of the darkened areas on the slide (5).

The appearance of the beta emitting ruthenium dioxide particles in a lung-autoradiogram preparation is illustrated in Figure 15. The spot-diameter darken ings of the grains of the emulsion varied in size and were seen to range from 8 μ to 170 μ. A linear correlation was seen to exist between the spot-diameter sizes and the ruthenium content of the slide.

The technique provides a means of measuring the radioactivity of a single particle or many particles within tissue when the development, processing and exposure are standardized. A practical application of the information gained from this method is seen in the deter mination of the quantity of Ru^{106} in particulate form necessary to cause an area of fibrosis in mouse lung (2). The area in Figure 16 and Figure 17 contains 9×10^{-4} microcurie of Ru^{106} based on a quantitative autoradiographic calcula tion. Examination of the series of auto radiograms in this area reveals that the radioactive particles cover a specific area which has a definite depth. The particles follow a pattern of deposition such that the accumulated dose from nearby par ticles is sufficient to initiate fibrosis.

D. Soluble $Sr^{90}SO_4$ particles in lung tissue:

Strontium sulfate particles were ad ministered to mice in a chronic adminis tration of 1 μc per animal by inhalation (8). Tissue fixation was in 80 per cent ethyl alcohol and the film selected was No-Screen X-ray with a thickness of 25 μ. Development was similar to that used for the other X-ray film. The slides were exposed for eight weeks due to the low activity density per section reg istered by counting techniques. The ability of the sensitive film to register activities that are undetectable by nor-

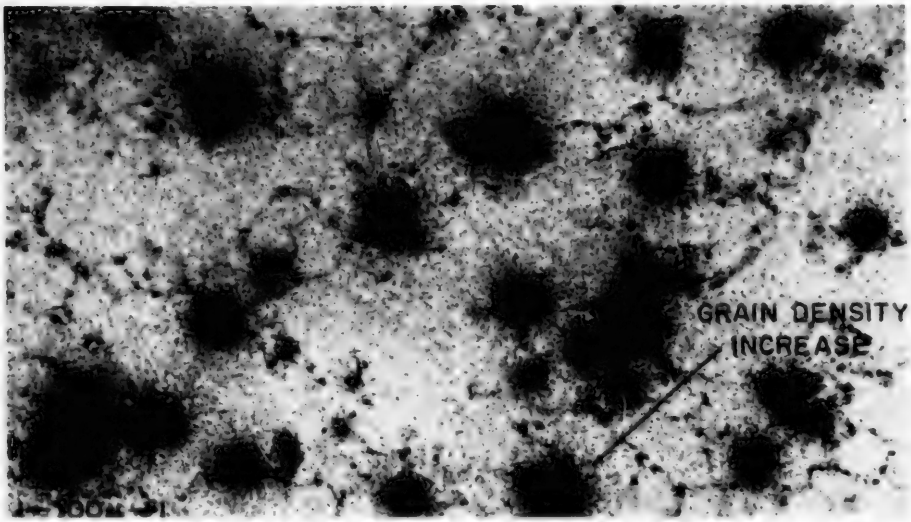


Figure 15. Photomicrograph of stained lung-autoradiogram preparation illustrating the deposition of ruthenium^{106} dioxide particles with resultant spot diameter darkening of the emulsion.

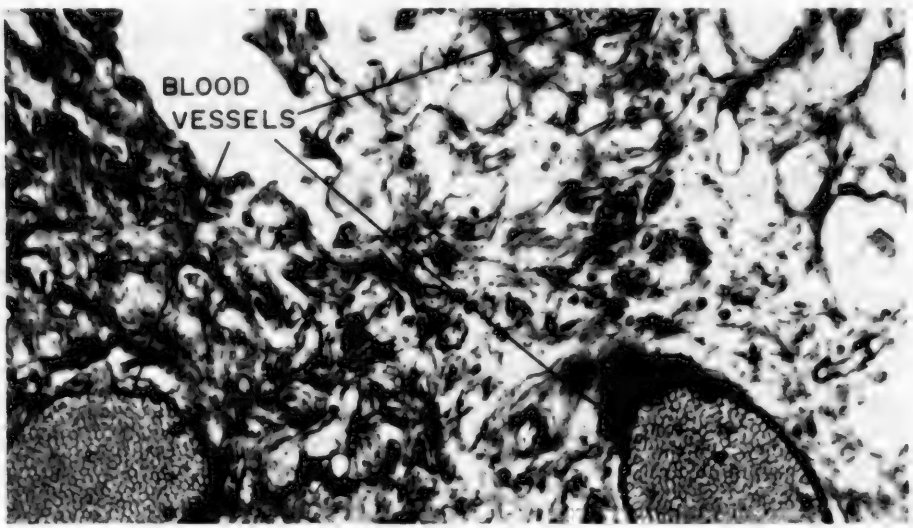


Figure 16. Typical area of mouse lung illustrating fibrosis and the presence of macrophages containing ruthenium^{106} dioxide particles. Area contains 9 x 14-4 μc based on a quantitative autoradiographic calculation. (175X)

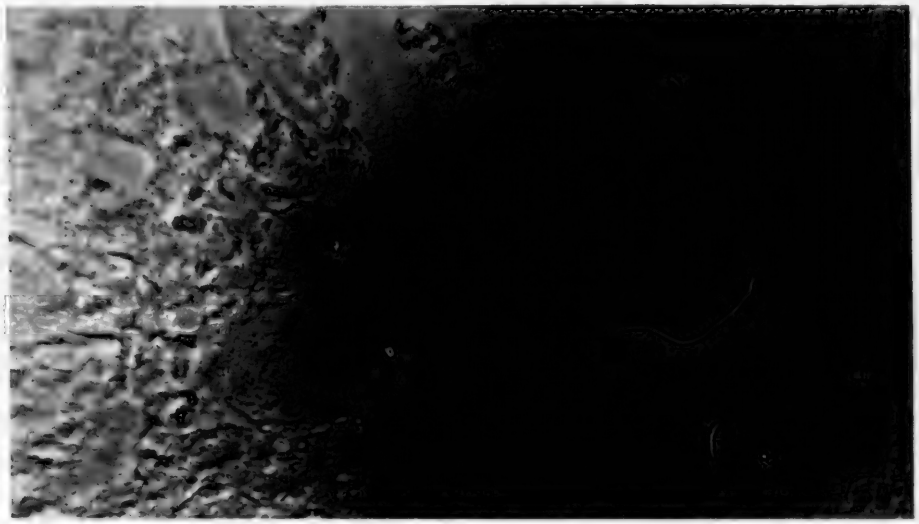


Figure 17. Phase photomicrograph of the autoradiogram (unstained) of section shown in Figure 16. Darkened area corresponds to area containing radioactive beta emitting particles. (125X)

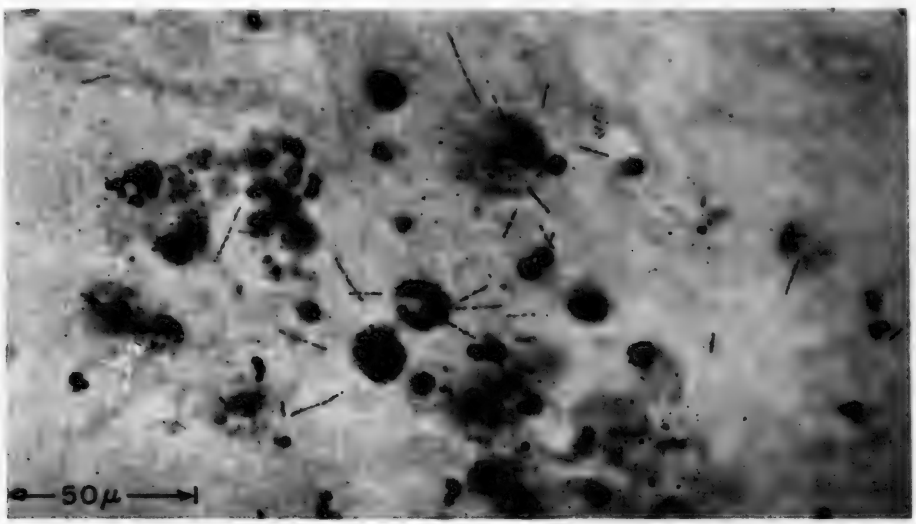


Figure 18. Autoradiogram of stained section of human sputum illustrating diffuse alpha track pattern of plutonium^{239} in solution following accidental inhalation.

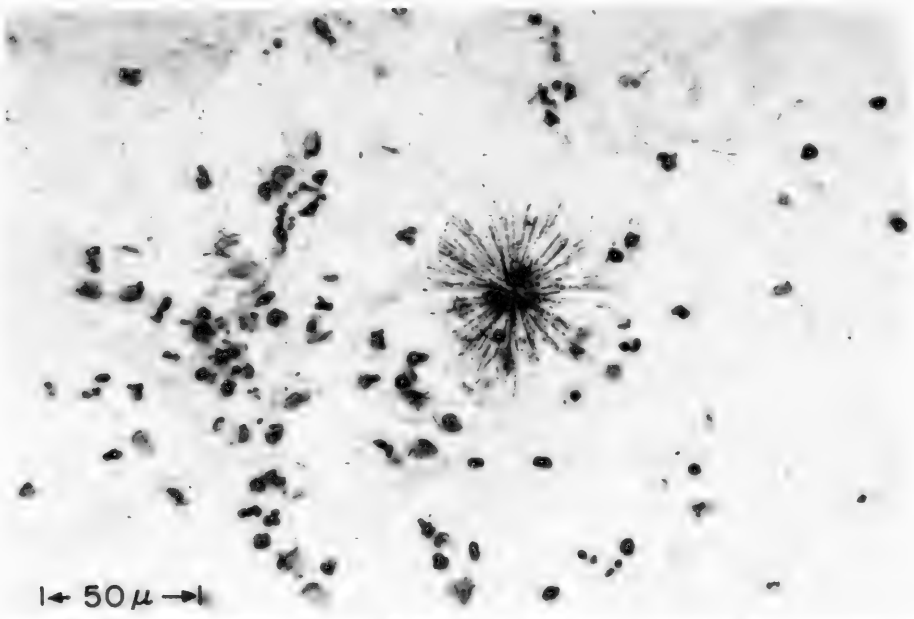


Figure 19. Autoradiogram of stained section of human sputum illustrating star formation of alpha tracks originating from plutonium particle in central position.

mal counting techniques is well known.

The autoradiogram of a lung section containing $Sr^{90}SO_4$ is seen in Figure 20. Both a particle and diffuse distribution are recorded. The stained histological section, Figure 21, is included for cytological comparison and orientation.

Part III. Application of the Autoradiographic Technique to Human Contamination

This portion of the paper describes a method for the autoradiographic analysis of contamination of humans by plutonium (6). Plutonium is a toxic substance and, following entry into the body, is eliminated with difficulty. Autoradiography is a method for determining the location of this radioactive substance in certain tissues.

The technique consists essentially of taking the biopsy specimen, fixing in 10 per cent formalin, paraffin imbedding and cutting of thin sections. The specimens included a 24 hour human sputum sample from a person suspected of inhaling plutonium and a human biopsy taken at the site of a puncture wound in the hand.

The paraffin sections were floated on 5 μ NTA film on 1×3 inch glass slides and exposed in a light tight box, after which they were deparaffinized, hydrated, developed in D-19 for 5 minutes, washed, fixed for 30 minutes in X-ray fixer, stained and capped.

The sputum specimen, after inhalation exposure, shows evidence of plutonium contamination in two forms. Plutonium in solution is identified in Figure 18 by the diffuse alpha track pattern among cellular elements of the sputum. In Figure 19 plutonium in the particulate form is identified from the star pattern of the alpha tracks underlying the cellular elements.

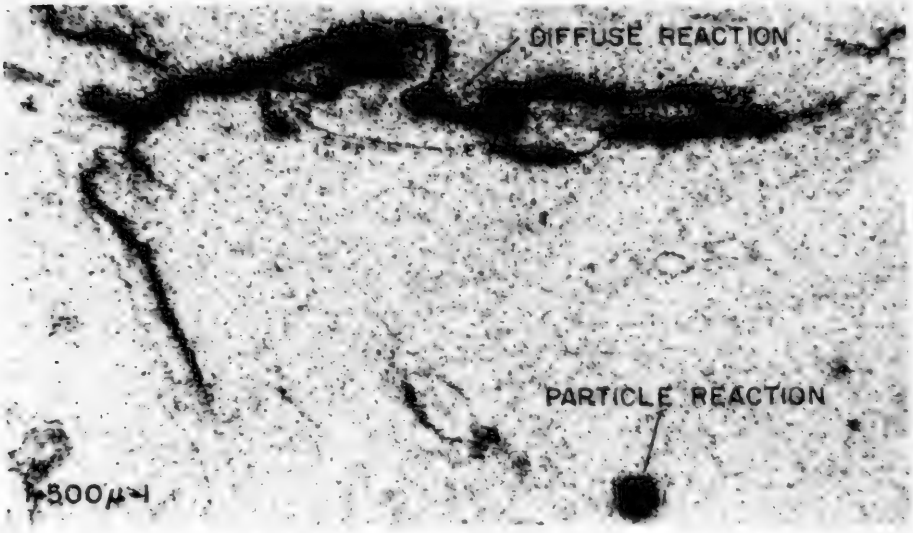


Figure 20. Autoradiogram of lung section from chronic $Sr^{90}SO_4$ inhalation experiment. Particulate and diffuse distribution with heavy background grain density of X-ray emulsion visible.

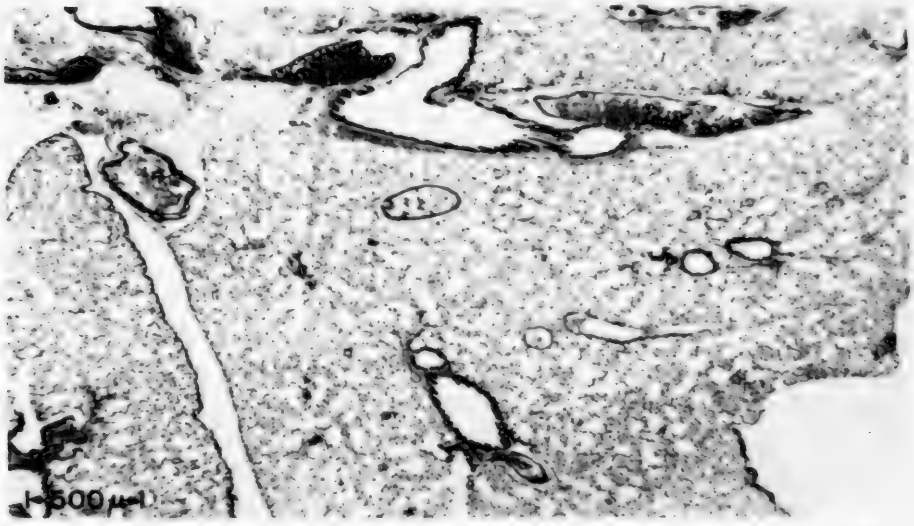


Figure 21. Hematoxylin and eosin stained histological section adjacent to Figure 20 for orientation purposes.

The plutonium contaminated skin specimen (7) yielded 250 individual sections which were scanned under a microthin window alpha detector. Thirty-three of the more radioactive sections were saved for autoradiography. The total activity for the entire specimen determined by radioanalysis was 0.0046 microcurie. Individual sections contained from 0 to 362 disintegrations per minute. Figure 22 illustrates the appearance and distribution of the plutonium in the human skin specimen autoradiogram.

Part IV. Suggested Methods for Illustrating Autoradiographic Specimens

An interesting facet of this type of research to the microscopist lies in the illustration of the autoradiograms in such a fashion that they will be easily understood by persons studying them. There are two lines of interest, one in the grain localization of the emulsion in relation to the histological detail and another in the staining reaction and appearance of the tissues in which the radioactive materials are found.

To satisfy these requirements it is obvious that a single photomicrograph will not present all of the necessary data. Therefore, the suggested method of choice is that of preparing alternate sections; one to be used for the autoradiogram to show localization of the radioisotope and one adjacent to this to show histological detail and pathological damage. These should be paired illustrations, so that the investigator may survey and compare the structure of the tissue with the autoradiographic density of the emulsion.

A satisfactory method for registering grains of the emulsion in relation to the stained tissue section overlying them is to assemble a horizontal optical bench, which has an adequate bellows draw, together with a 16 mm apochromat and a low Ultraplane or similar ocular to insure a flat field. The achromatic condenser should be of the divisible type with an N. A. of 0.25. This combination will insure spherical and chromatic corrections with a relatively flat field. Sufficient magnification is obtained by using the bellows draw to increase the magnification to that desired in the photomicrograph. Generally, contact printing of an 8×10 negative is desired, but further magnification of the desired portion of the negative is possible by enlargement. By this arrangement a specimen 5-6 μ thick lying on an emulsion 5-10 μ thick may be brought into focus. Emulsion thickness may be as great as 100 μ when beta emissions are to be recorded. Emulsion sensitivity requirements may dictate the use of X-ray emulsion 25 μ thick. Any increase in thickness of the emulsion or grain size complicates the problem of registering the tissue and grains of the emulsion in a single photomicrograph of the autoradiogram. Limited use of the condenser iris diaphragm may increase the sharpness of the image and increase the field depth slightly, but generally a 9/10 cone is not exceeded. Focusing should be done to insure detail of the emulsion and, of course, the matching photomicrograph should be focused on the cellular elements of the histological preparation. This preparation has no overlying emulsion to complicate the procedure. The field depth may vary from 10 μ with the 16 mm objective to as little as 0.5 μ with the 2 mm objective. Thus the registration of all detail in a preparation that is 10 μ thick is an impossibility unless the suggested method is utilized.

These are some of the applications of autoradiography today. Soon we will see the autoradiographic technique ap-

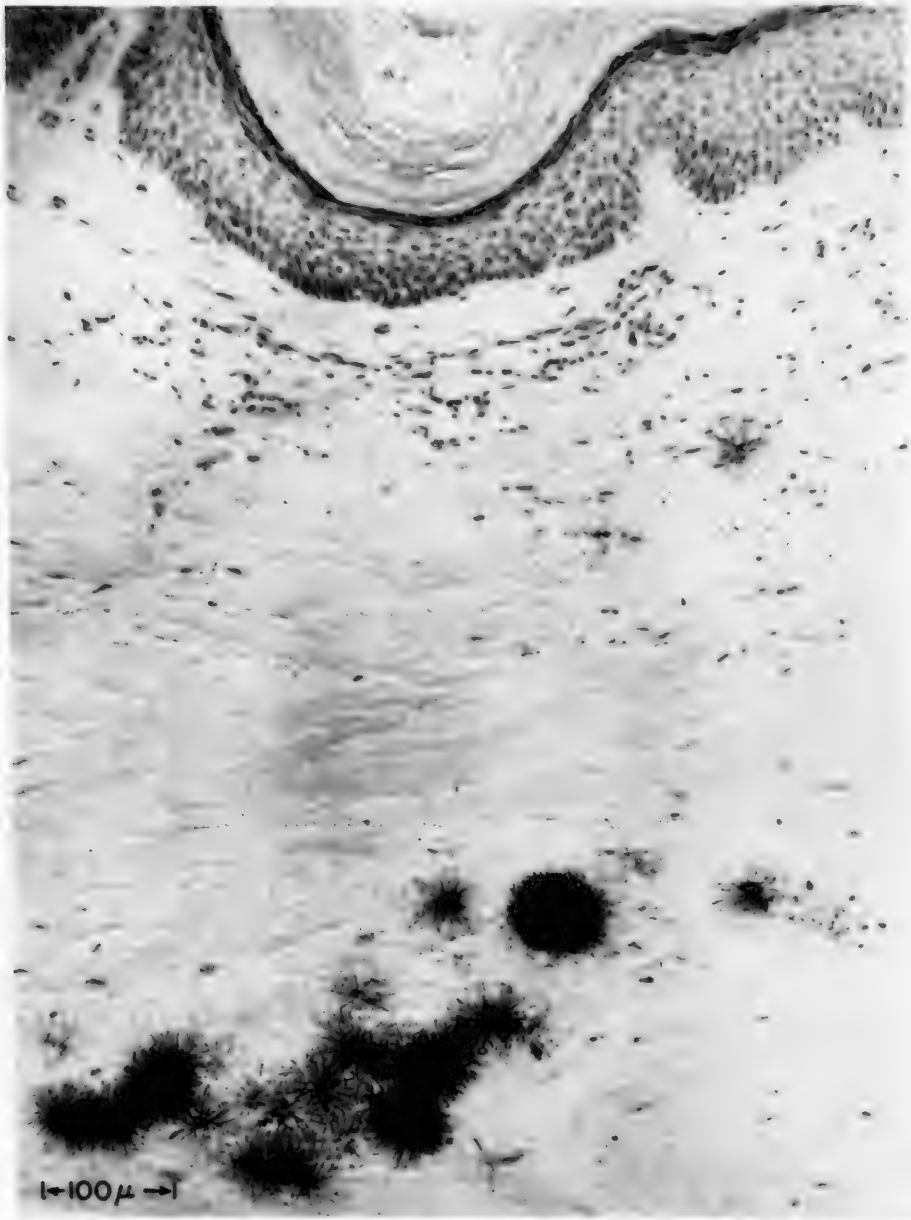


Figure 22. Autoradiogram of human skin showing distribution of plutonium and alpha tracks approximately 800μ beneath *stratum corneum*. Hematoxylin and eosin stained preparation.

plied to electron microscopy by the use of a very thin emulsion containing a single layer of grains, each of which is less than 0.2 μ in diameter. This will be floated over the electron microscope grid containing the radioactive specimen or by the imbedding of the specimen in the emulsion itself, which after exposure and development will be reimbedded in methacrylate, and sectioned at less than 0.1 μ. Upon examination the grains of the emulsion, which themselves will have been sectioned, together with the tissue are visible in relation to the cellular elements. The results obtainable are only limited by the adaptability of the scientist and the photographer to the problems at hand.

REFERENCES

1 Dockum, N. L., and Borasky, R., 1957. "Shadow autoradiography of beta-emitting particles," Nucleonics, Vol. 15, No. 11, 110.

2 Wager, R. W., Dockum, N. L., Temple, L. A., and Willard, D. H., 1955. "Toxicity of radioactive particles, IA. Intratracheal injection of radioactive suspensions," Document HW-41500, p. 61 (UNCLASSIFIED)

3 Vogt, G. S. and Kawin, B., 1957. "Localization of radioelements in rat ovary," Document HW-53500, p. 120 (UNCLASSIFIED).

4 Unpublished data

5 Dockum, N. L. and Healy, J. W., 1957. "Spot diameter method of quantitative autoradiography of ruthenium^{106} particles in lung tissue," Stain Technology, 32(5): 209-213.

6 Dockum, N. L., Coleman, E. J. and Vogt, G. S., 1958. "Detection of plutonium contamination in humans by the autoradiographic method," Stain Technology, 33(3): 137-142

7 Dockum, N. L. and Case, A. C., "Autoradiographic analysis of plutonium deposition in human skin," Acta radiologica, (1958) 50:559-64.

8 Unpublished data, W. J. Bair

Journal of the Biological Photographic Association Vol. 27, No. 1 February, 1959

Film Characteristic Curves Using the Densichron and Gray Scale Chips Supplied with the Densichron Reflection Unit

PRESTON F. GOTT

Department of Physics
Texas Technological College, Lubbock, Texas

Abstract

LABORATORIES which have a Densichron may extend its applications to include the making of film characteristic and time gamma curves by analysis of transmission densities of photographic negatives of the chips supplied for calibration of the reflection unit.

Calibrated reflection density chips under uniform lighting give a photographic target with areas of known relative brightness. The gray scale chips are those included as a part of the Densichron No. 2150A Reflection unit and may be bought as a separate item. The reflection values are stated as those based on measurements with the G.E. recording spectrophotometer, plotted by the Container Corporation of America, Color Standards Department. The spectral response curves are a part of the data supplied with a "Color Harmony Manual" designed and manufactured by the Container Corporation of America: The gray scale is a part of this "Color Harmony Manual." The reflection densities of these chips are stated and may be used to give known values on a linear scale of decreasing reflection densities as the log exposure axis in plotting the transmission densities of a photographic negative of these chips, giving the characteristic curve of the negative.

The values of reflection density of the dull side of these chips are from .06 to 1.43, a scale from highly reflecting white to nearly black. This is a shorter subject brightness scale than is sometimes dealt with in translating the brightness variation of a scene into variations in the brightness of a positive print. By using two sets of the chips, with one set viewed from the glossy side, there are available reflection densities to 2.22. Although, as shown in figure 3, the .06 to 1.43 range of subject brightness is not enough to plot out the entire characteristic curve of a given film and developer combination, a range from .06 to 2.22 would cover a longer portion of the log exposure axis which would correspond to a scene in which the bright areas were 145 times as bright as the dark areas.

Another technique to extend the log exposure scale involves use of the Densichron to monitor changes in image brightness. As shown in Figure 4, decreasing the brightness of the image formed by the camera lens on the nega

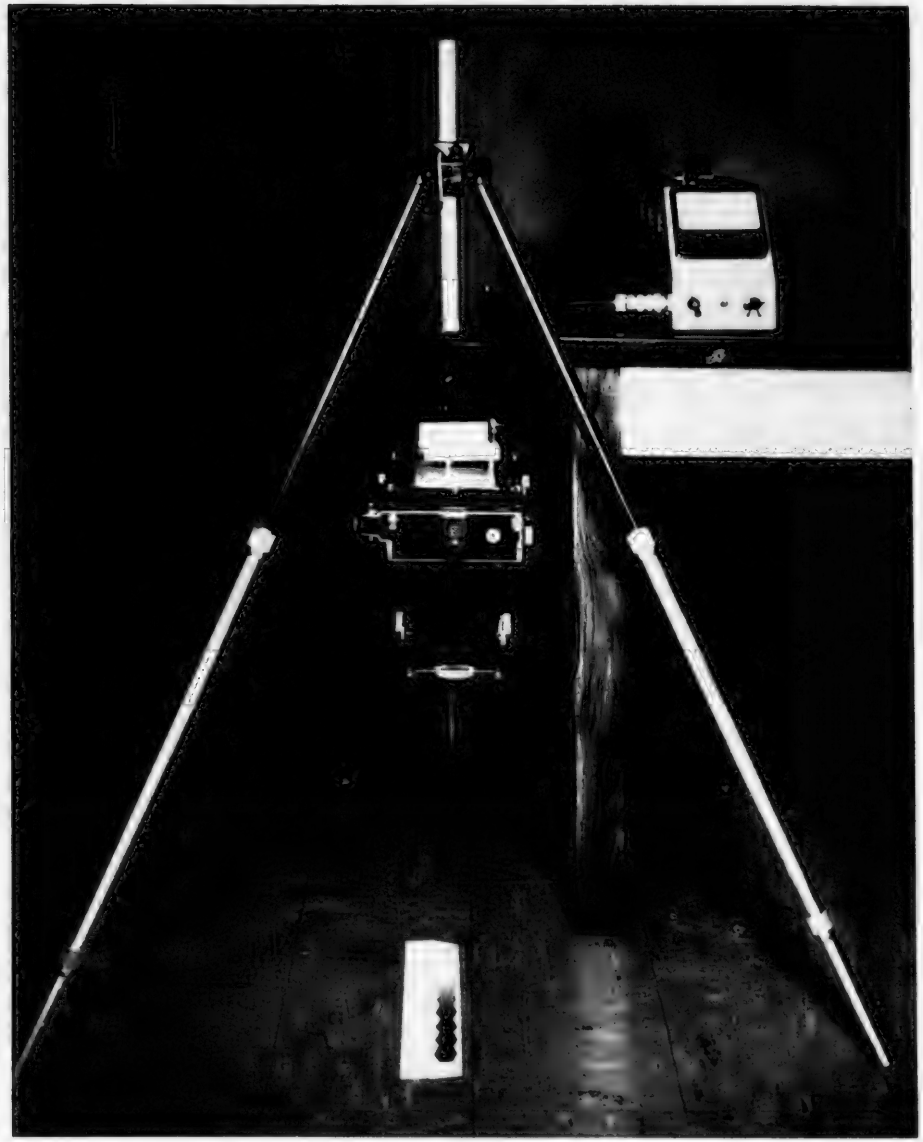


Figure 1. Arrangement of apparatus to expose negatives to light reflected from the gray scale chips. The camera back and densichron head are covered with a black cloth when it is being used to monitor light when changing image brightness by means of iris diaphragm.

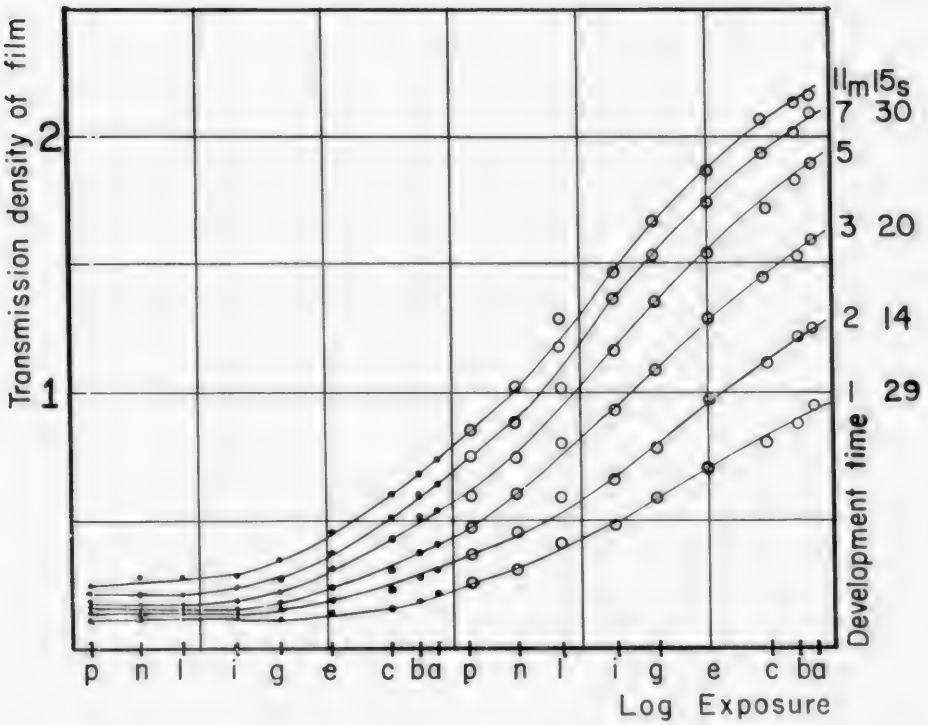


Figure 2. Characteristic curves plotted from negatives of the gray scale chips taken at two different aperture stops. The illumination on the camera groundglass was read on the densichron and was changed to produce a density reading 1.5 smaller for the circled points than for the solid points bearing the same letter. Lettered values of log exposure are (reflection densities of gray scale chips) (difference in densichron readings of an area under the two conditions of image brightness). The meter candle seconds of this set of coordinates is not evaluated, but this could be done as described in the text.

tive by a factor of $\sqrt{10}$ x 100 will move the position of the log exposure coordinates by −1.5. A factor of 10 or 100 will move the position of the log exposure coordinates by a factor of −1 or −2. To add 1 or 2 to the log exposure coordinates, the brightness of the image on the negative must be increased by 10 or 100 times. These changes in the brightness of illumination of the negative can be measured on the densichron, using the transmission head to pick up a portion of the image on the groundglass, observing an increase of 1 in density reading with each factor of 10 decrease in image brightness. Decreased image brightness gives a decrease in log exposure, so these increases in densichron reading are to be subtracted from the reflection densities of the gray scale chips. By moving the log exposure values for each chip to the left by a fixed amount, equal to this increase in densichron reading of the image, the characteristic curve may be extended to the left. This could be a brightness factor of 10, but it is not restricted to any particular value. A change in densi

chron reading equal to the difference in reflection densities of the lightest and the darkest of gray scale chips would make the curves join. An acceptable procedure is to allow a gap between the sections of the curve about equal to the spacing between points on the curves. For ease in plotting the exposure for each chip, the suggested procedure is to use a ruler made of a strip of paper with two marks on the edge, spaced by the change on the log exposure axis equal to the change in densichron reading as the image brightness is changed. The two values of log exposure for each chip will be separated by this amount. This is adapted to quick handling of differences in log exposure that are not integers, as well as those that are.

If the value of foot candle seconds used is needed, the lensboard is removed from the camera and, using the transmission head, the densichron is read behind the groundglass when the illuminance on the groundglass is a known number of foot candles. A first order approximation may be obtained from the formula foot candles equals the candle power divided by the square of the distance to the lamp, assuming a 60-watt lamp to be equal to 60 candle power, or, a better value may be obtained by measuring the foot candles with a foot candle meter. When using this calibration to measure the illuminance of a uniformly bright portion of the image, the densichron probe is placed on the groundglass over this portion of the image. The back of the camera and densichron head are covered with a focusing cloth to prevent entry of extraneous light. The densichron reading of groundglass brightness would increase .3 from this calibrated setting for each halving of brightness. To translate these into exposure readings, the image intensity would have to be multplied by the exposure time. Each .3 decrease of log reflection density will correspond to .3 increase in log exposure, and to an increase of 2 times in exposure. Fortunately, the measurements described in this paragraph are not necessary unless the value of the number of foot candle seconds acting on the film is needed. The separate measurement of illumination of the film and the effective exposure time are complications not needed in the practical application of the procedure described here. The factors which are lumped together here are those which would be lumped together in a practical case. The camera lens would give image brightnesses which could be considered proportional to object brightnesses and the exposure could be considered the same for all parts of the film.

Figure 2 shows a set of characteristic curves made as described above. The readings of a white card of reflection density .10 was 400 candles per square foot on a Weston Master II Meter. This card was photographed beside the set of calibrated gray scale chips. The image distance was 1.5 focal lengths. The sensitivity of the densichron was adjusted to give the reading of 3.0 when reading the groundglass image of this card at f/16. The camera diaphragm was closed to make the densichron read 3.9, a decrease of brightness to $1/8$ its previous value. An exposure of 1/100 second was used to make the exposures of 6 negatives on Royal Pan. The densichron readings were decreased from 3.9 to 2.4 by opening the iris diaphragm of the camera. This was a change of 1.5, the separation of the two log exposure values of a given chip when the two films' data were plotted. Any unevenness in transmission of the groundglass will make the densichron reading depend on the posi

tion of the head. In order to minimize this source of error, the densichron head is positioned in the corner on the groundglass while making each reading. A loss of position on the groundglass while changing the illumination of the image would be an irretrievable error which might be small, but still beyond recall. Changes in position of the densichron on the groundglass and changes in image brightness are indistinguishable. After brightening the image by this factor that decreased the densichron reading by 1.5, six more films were exposed, using the same shutter speed, so the shutter speed, though unknown precisely, would be constant. Adjustment of the iris diaphragm and changing the distances of lamps can be used in changing the image brightness. The voltage supplied to the lamps was not changed. Holding shutter speed and color temperature of the illuminant constant reduced possible error from reciprocity failure and from lack of similar spectral response in the film and densichron.

The gray scale chips and the card in which they are mounted were placed flat on a box 15 inches high and illuminated by two #4 blue photofloods in 16 inch reflectors with silk diffusion screens. The voltage on the lamps is reduced by a variac to reduce their output of light to 400 candles/ft.^{2} reflected from a white

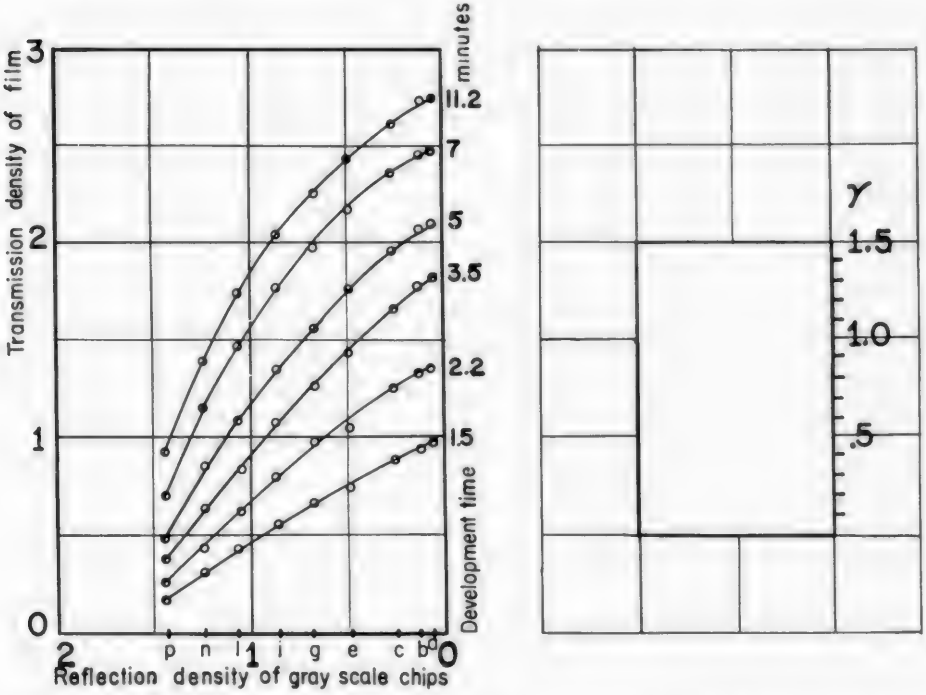


Figure 3. Characteristic curves of a film, made from photographs of a set of gray scale chips: A card with a rectangular aperture to be placed over the characteristic curve to read gamma. The width of the aperture is one unit on the log exposure axis, and its height is marked with values of gamma. In use, the lower left-hand edge of the aperture is placed at the appropriate position on a characteristic curve and the gamma read off where the curve strikes the right-hand edge.

card of .10 reflection density with approximately 21 inches from the center of the diffusion screen to the center of the reflection density chips. The reflectors were aimed from opposite sides at an angle of approximately 45° down at the gray scale chips. When the image brightness was reduced for the second group of exposures, the lamps were moved up and back to give the approximate intensity setting, and the remaining adjustment was accomplished by a small adjustment of the iris diaphragm. The lamps are mounted on Victor BR3 roller bases, and these can be moved back and up to decrease the illuminance of the reflection density chips by a suitable factor. The lamps can be raised so that the center of the diffusion screen is 104 inches from the floor. A white card substituted for the reflection density chips was scanned with a Weston Master Me ter to check the field of view for uni formity of illuminance.

An alternate method to dim the image would be to use neutral density filters if they were available. Any small addi tional changes in the illuminance of the groundglass could be made by use of the iris diaphragm.

The films were placed in hangers and one negative of each image brightness was developed for 1 minute 29 seconds, 2 minutes 14 seconds, 3 minutes 20 seconds, 5 minutes, 7 minutes 30 seconds, and 11 minutes 15 seconds. The tem perature was 68°F. The developer was the M H developer used in the photography course at Texas Technological College. It is a D-72 type developer with the carbonate kept separate and mixed in different ratios and dilutions for different uses. The films were placed in the tank with the more heavily exposed film at one end. When a given development period was over, one film hanger was removed from each end and placed in the shortstop. After 10 seconds' agitation, it was taken to the hypo and agitated intermittently there.

Measurement of the transmission density of this set of films was made with the densichron, with the transmission head and film supported by a $4\frac{1}{2}$ inch x $8\frac{1}{2}$ inch piece of $\frac{1}{2}$ inch masonite firmly mounted over a contact printer with an opal glass diffusion surface $\frac{3}{4}$ inch below the film. A hole is made for the light to pass through the board into the photocell and two holes are drilled partially through the board to position the two legs of the photocell support.[1] This probably approximately reads diffuse density. The light comes from below from an angle approaching 180°. To increase this angle, the bottom edge of the hole through which the light passes has been beveled. The ratio of specular to diffuse density enters in as a practical matter in enlarging. That the diffuse gamma is lower than the specular gamma is shown by the difference in diffusion and condenser lamp housings. In our procedure it will suffice to set up for the measurement of diffuse density. This is a rough and ready method of good precision, cheaply available for laboratories having a camera and a densichron.

Factors which reduce precision to which no consideration has been given are: 1. The $\cos^4$ illumination factor of a camera lens. This is neglected. 2. The lack of uniformity of the illumination of the set of gray scale chips photo graphed. This is reduced by using large reflectors a reasonably large distance away. The effect of the factors 1 and 2 could be evaluated by making a photograph of a large gray card beside the gray scale and reading the densities of various portions of the negative. 3. A lack of uniformity of development of a

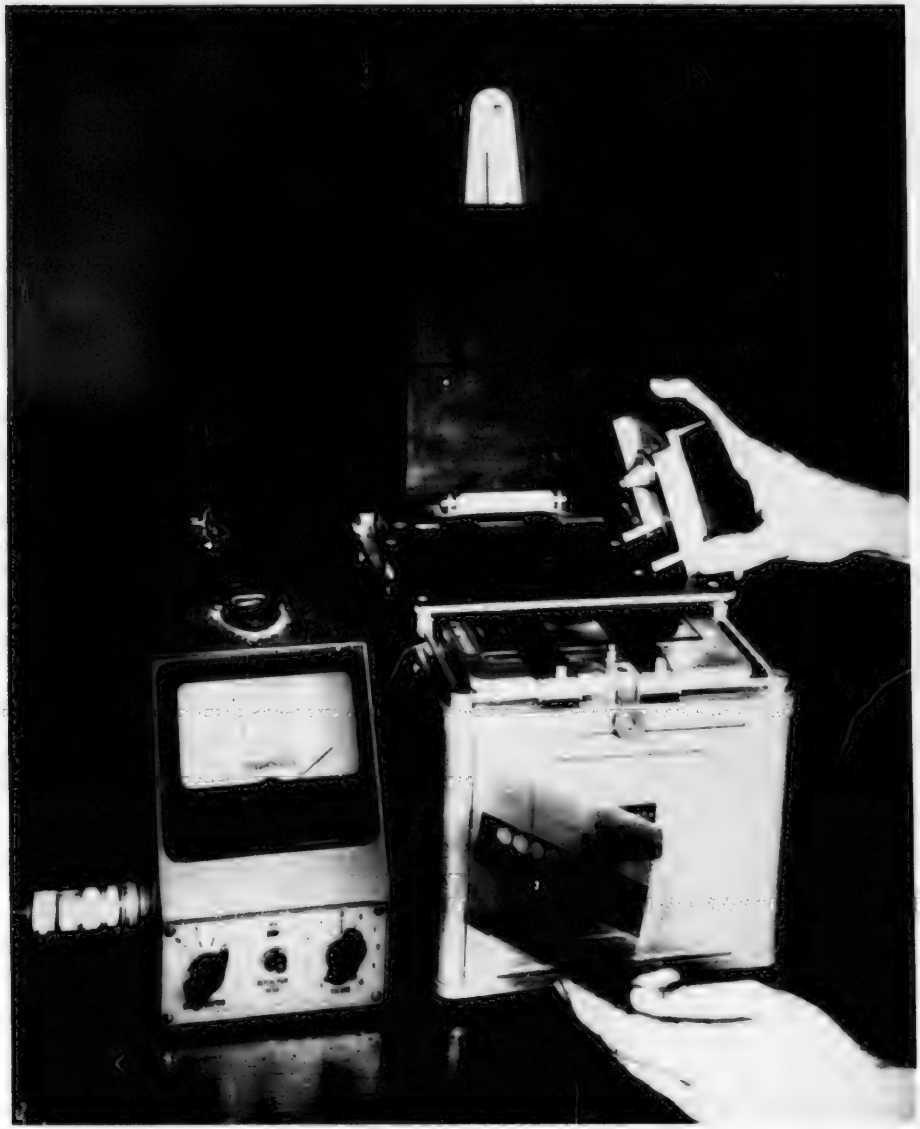


Figure 4. Contact printer adapted as light source for use with the densichron as a densitometer. The supports of the densichron head position it by fitting into holes partially through the masonite work surface.

given negative. This has been covered in other literature more fully than I could try here. However, the agitation procedures followed in ordinary processing would give realistic data. 4. Warming or cooling of the developer during the processing. Keep the darkroom atmosphere at about 68° if possible. This is not a large factor. 5. Errors in time of development. A large timer with a luminous dial was used to time development. 6. Lens flare. This would be of some significance for the darker portions of the image. The influence of lens flare would be greater for dark portions of scenes with a greater portion of their area bright, or in situations where oblique light strikes the lens. Uncoated optics would give more trouble than coated.

Factors whose effect is lumped or reduced are: 1. Transmission of the lens and actual shutter time. As long as these are the same for all parts of the film, this method will give gamma values for a given camera, light meter, film, developer, and operator combination. 2. The effect of different color sensitivity of the film and densichron is eliminated by changing the image brightness by changing the f number and distance, leaving the lamp voltage unchanged. 3. Effect of the reciprocity law failure and errors in ratio of shutter speed is eliminated by using the same shutter speed.

FOOTNOTES

[1]For a discussion of spectral and diffuse densities, see Mees, C. E. Kenneth, *Theory of the Photographic Process*, 1938, pp. 640, 641

[2]A procedure for obtaining the development constants from two sensitometric strips is described in Mees, *op. cit.*, pp. 751, 752.

REFERENCE

Weber, Julius, and Shapiro, Gershon: Exposure Evaluation From Photometer Measurements in Multiple Lens System Photography, J.B.P.A., 21, No. 2:11-33, May, 1953.

Journal of the Biological Photographic Association Vol. 27, No. 1 February, 1959

Pre-print Preparation of 16mm Motion Pictures

ALLEN HILLIARD,
Laboratory Consultant,
Geo. W. Colburn Laboratory, Inc., Chicago, Illinois.

Introduction

IF there is a point-of-no-return in the production of a motion picture, it is the instant before a laboratory technician throws the switch on the printer to make the first sound print. There before him are the original picture and sound track rolls, the product of weeks or months of thoughtful work, with a decision made at each step of the way. Now, there are no more choices to be made. The story told by the first print will reflect the original picture and sound track rolls as they now stand. How well the story is told depends on the degree of care and judgment exercised by the producer in selecting and preparing the picture and sound elements that are now fixed and ready to roll. To guide the producer in selecting and preparing the picture and sound, we should go back to the point in production when the photography has been completed.

Workprinting

The processed original motion picture film is on hand, and the first temptation is to project it. Avoid that temptation! A projector scratch in the original will appear later in every print. Or, even worse, irreplaceable original footage may be torn or damaged beyond use. Furthermore, Ektachrome Commercial Film (#7255) is not color balanced for direct projection, and is especially susceptible to damage by scratching. Instead, the original should be viewed over a light-box. Out of focus and badly exposed scenes can be detected and removed. The usable takes are spliced together and sent to the laboratory with instructions to make a workprint, an inexpensive, one-light (no exposure correction) duplicate of the original film. Either color or black and white workprints can be made from color originals. However, since color relationships within a scene are often the basis for scene selection, the greater cost per foot of color workprint is well justified.

Both the original and workprint rolls are imprinted with matching edge-numbers. Thus, a permanent and easily read relationship is established between the two rolls. The original, still in perfect condition, is then stored for safe keeping and the workprint delivered to the producer for editing.

Picture Editing

In editing the workprint, the producer may be guided by two intentions. In one sense, he will eliminate all the mechanical faults that are present in the footage. Obvious defects, such as flash frames at the beginning or end of camera scenes, or scenes with unsteady camera movements should be removed. Vigilance here will spare the viewer from any stimulus that will shift his

attention from the film story to the problems of movie-making.

In a more constructive sense, the producer will focus his attention on scene selection in terms of sequence, scene action and footage length. The scenes selected will be spliced together to show the viewer exactly what he should see at the precise time that he should see it. At every cut, he should bear in mind that the viewer will have seen what has gone before just once, and doesn't know what's to follow. Frequent screenings of the workprint as the cutting progresses will be necessary to make sure that the viewer will be properly oriented to each scene. During the editing, there are endless decisions to be made, but it is the selection of the best choice from several alternatives that gives the film its visual power.

Preparation for Recording

When the edited workprint tells the story as well as possible, visually, the producer can prepare for the sound recording session. Whether the narration script has been written, or yet needs to be written, the producer should have a list of scenes with a note on the footage length of each scene. This is easily measured with a footage counter, or may be calculated simply by noting edge numbers at the beginning and ending of each scene and subtracting to obtain the difference. A maximum word allowance of four words per foot is usually satisfactory, although three words per foot may be safer for highly technical narration. If these limits are exceeded, the narrator will have to read at a forced, unnaturally fast speed. Or, with too many words, the narration will spill over into the next scene which may be entirely different in subject matter. The scene list with word allowance is then used as a guide in writing the script, or in checking to make sure that a previously written script will fit the edited workprint. This check may uncover the need to condense the narration, or to add an appropriate related scene from unused workprint scenes.

Special attention must be given to word allowance when one sentence of narration covers two successive scenes, and the scene change must fall on a given word. The word allowance is even more critical when a series of narration words must synchronize exactly with a series of actions within a given scene. It may be necessary to project the scene several times while reading different versions of the narration to arrive at the best fit.

Narration Recording

The best possible sound track will result from recording in a sound studio on professional recording equipment. Generally, the original recording will be made on magnetic film or tape, and the characteristics of this recording should fit the requirements of the final optical sound track. The following procedure is typical:

1. Rehearse the narration while the workprint is projected to make sure the sound will synchronize with the picture.
2. Record the narration. The recording director should mark a script copy for sentences which must be redone to correct for any mistakes made in the reading.
3. Retake sentences marked for correction.
4. Listen to playback of the entire recording to make sure all mistakes have been corrected.
5. On the editing table, remove bad takes and splice in good takes so

that the recording is complete and correct.

6. On the editing table, synchronize the magnetic voice track with the edited workprint. Individual sentences can be moved up or dropped back by cutting out pauses or splicing in silent magnetic stock as a spacer. The workprint can also be cut to adjust to the final voice track.
7. Music, if used, is selected and cued to fit the picture and voice track.
8. The voice track and music are re recorded to make the optical sound track for printing.

PREPARATION OF 16MM FILMS FOR PRINTING

This folder contains our specifications for marking work prints and originals, preparing leaders and setting up original 16mm A & B rolls.

Picture A & B rolls set up in accordance with the recommendations of the Association of Cinema Laboratories or our own recommendations will result in prints incorporating fades and lap-dissolves as well as invisible splices at no extra charge. Wipes, irises or other special effects can only be included by making special optical masters.

METHODS OF MARKING WORK PRINTS AND ORIGINALS TO INDICATE EFFECTS

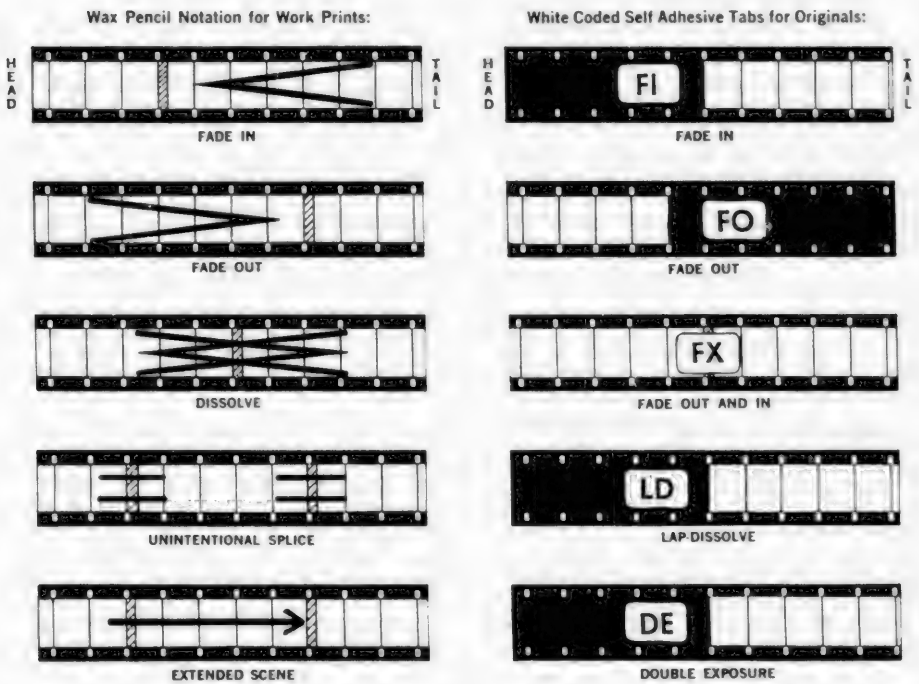
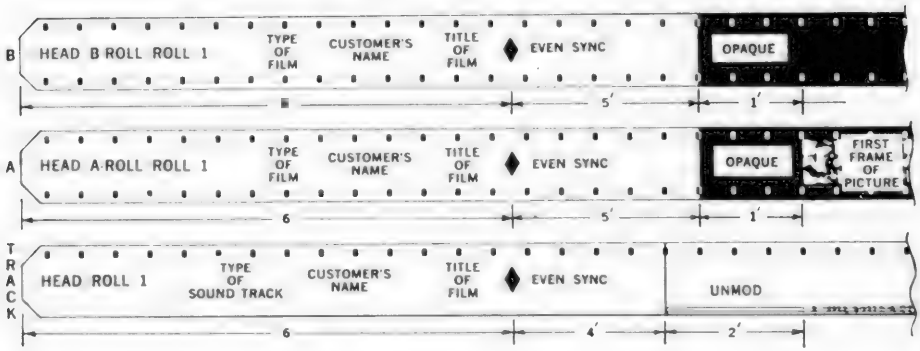


Figure 1.

PREPARATION OF 16MM HEAD & TAIL PRINTING LEADERS

HEAD LEADERS



TAIL LEADERS

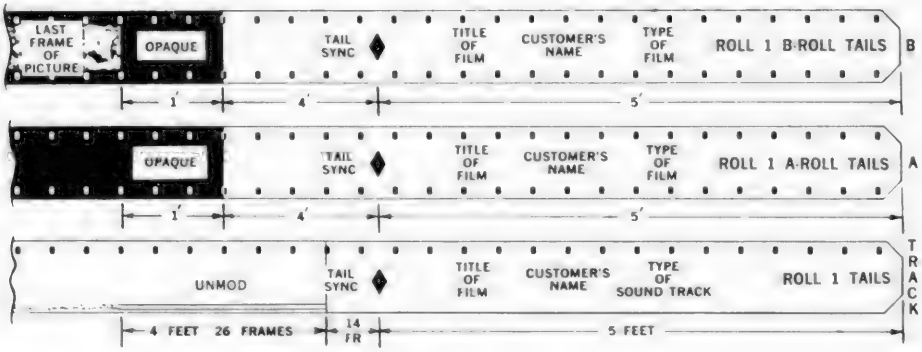


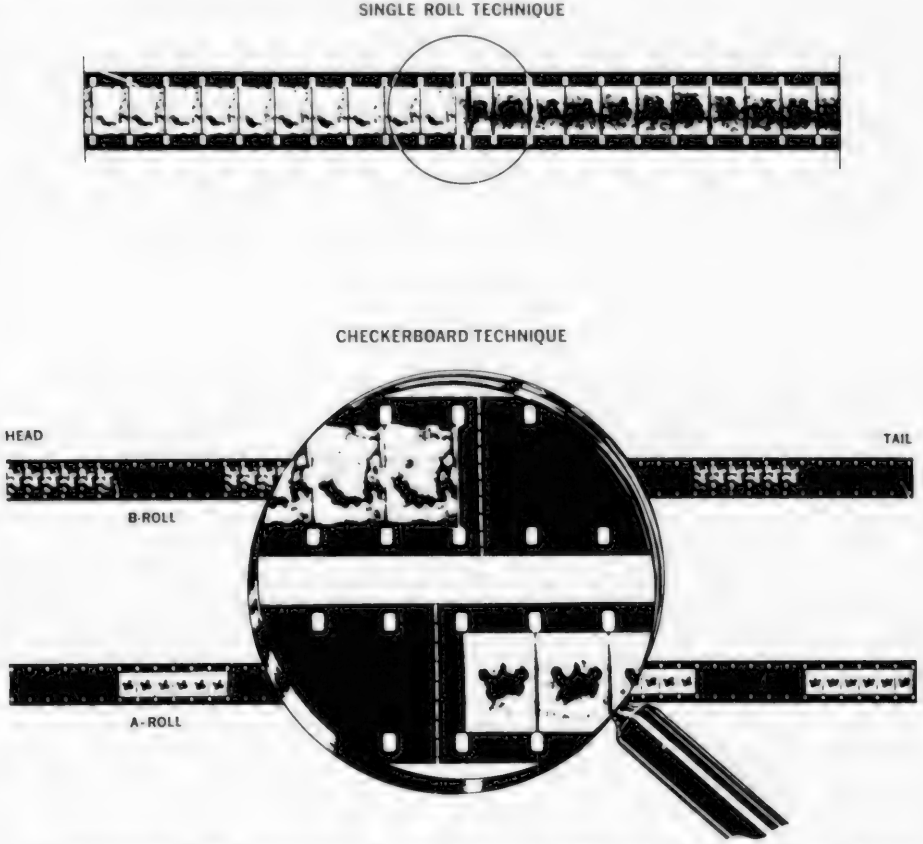
Figure 2.

Preparation of Originals

With the edited workprint in its final form, the original footage may be conformed. Since the workprint and original scenes bear identical edge numbers, the original can be matched exactly to the workprint. This operation can be done by the individual producer, following the recommendations of

EDITING AND PRE-PRINT RECOMMENDATIONS FOR 16MM ORIGINAL FILM

The checkerboard technique of preparing films for printing is used to eliminate the visible overlapping bar that appears when two pieces of film are spliced together.

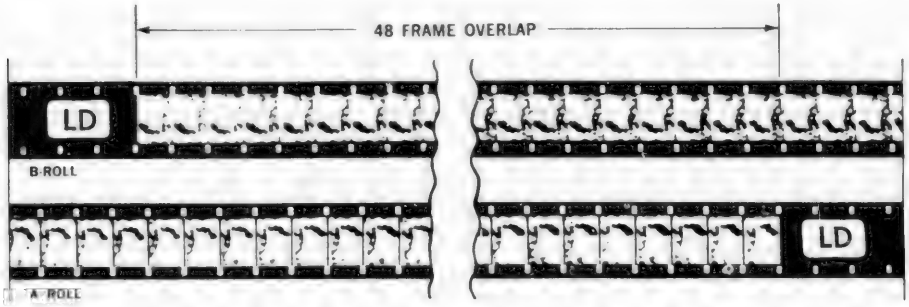


This checkerboard technique is accomplished by alternating the scenes back and forth on the A & B rolls. The splices should be made in a splicer that makes one of the cuts on the frame line and the other cut in the picture area. When splicing the scene to black leader, the scene should be placed in the splicer in such a manner that the scraped portion and visible cut of the splice occur only in the black leader. After splicing the head of the scene in this manner, you will note that in order to correctly make the splice at the tail of the scene, it will be necessary to turn the scene around in the splicer.

Figure 3.

the laboratory as is shown in figures 1 through 4. However, matching original film, especially in A and B rolls, is best done by the laboratory. Trained technicians, experienced in film handling and printer requirements, using professional splicers, are better equipped to do a careful, efficient job.

DISSOLVES—A lap dissolve is a transitional effect in which one scene fades out at the same time that a second scene fades in.



It is suggested that 48 frames be used as a standard overlap in preparing your A & B rolls for dissolves

BLACK LEADER——It is recommended that only black leader be used between scenes. This completely opaque film is obtainable from the GEO. W. COLBURN LABORATORY

DOUBLE OR SINGLE PERFORATED LEADERS — It is recommended that only double perforated leader be used when all the original is double perforated. When some or all of the original is single perforated, the use of single perforated black leader is recommended to prevent possible future damage to the original. The perforations in the black leader should, of course, be on the same edge as the perforations in the original

SERIES OF EFFECTS—When dissolves or fades follow each other at very short intervals, caution should be exercised. The editor should remember that on a single roll, no new effect can be started before the last effect is over. It would be impossible to start a fade-out after a fade-in, until the fade-in cycle had been completed. With a standard of 48 frames overlap, it is recommended that the minimum length of a scene that incorporates an effect at each end be no shorter than 108 frames in the original A & B rolls; 48 frames for the fade-in, 48 frames for the fade-out, leaving 12 frames as a safety factor. This scene in the cut work print would then be no shorter than 60 frames.

DISSOLVES FOLLOWING CUT-ACROSS—If a dissolve or fade follows black leader after a cut-across scene in the original A & B rolls, it is recommended that the black leader be no shorter than 54 frames. This allows 48 frames for the mechanical fader to fade-out in order to be ready for the fade-in on the beginning of the following effect scene. The 54 frame length allows 6 frames as a safety factor. The same recommendation applies when the effect precedes the cut-across.

ORIGINAL NEGATIVE—We do not recommend the use of original camera negative in 16mm motion picture production. It is possible to print straight-cut edited negative but splices, handling-dirt, or scratches show up prominently on the screen as white marks. Satisfactory prints incorporating fades and dissolves can NOT be made by setting up original negatives in A & B rolls.

Where only original negative is available and these effects are required, a **master positive** of the complete negative must be made. This master is then edited in A & B rolls in the same manner as original reversal black and white or color. Original reversal cannot be intercut with this master positive because of emulsion position.

INSTRUCTIONS TO THE LABORATORY — Full instructions should accompany each producer's film when it is sent to the laboratory. They should indicate in detail all special effects. When footages are used to indicate where effects are desired, measure the footage from the even sync mark in the head leader.

Self adhesive labels can be used on the film itself with safety. It is recommended that the adhesive label be placed on the black leader rather than in the scene, and on the emulsion side of the film.

Figure 4.

Conclusion

It is evident that the individual producer plays a major part in bringing the picture and the sound track to the point of-no-return. Beyond that point, the effectiveness of the finished sound print can only reflect the accumulation of choices made at each step of production. An understanding of the relationship of each step will help the producer make the right choice.

Journal of the Biological Photographic Association Vol. 27, No. 1 February, 1959

Nonmedical Photography in a Medical Institution*

ERVIN W. MILLER

Section of Photography
Mayo Clinic, Rochester, Minnesota

PHOTOGRAPHERS in almost all medical institutions are encountering an increasing number of applications for photography not specifically linked to medical subjects. These special requests are likely to increase, rather than diminish, and some of them may well be concerned with new uses for photography devised to save time or money.

Among larger institutions, some of the better-known opportunities for special uses of photographic methods and materials include the photostating of valuable documents, the microfilming of institution records, the photographic recording of bank checks offered in payment of fees, the copying of forms and other printed matter to be reproduced by multilith or offset photomechanical methods, and the making of portraits or identification photographs of personnel.

Some institutions are receiving frequent requests for photographs which will be used for purposes which can be classified only under the broad term "public relations." These requests may come from officers or program chairmen of local medical societies, or from representatives of newspapers, magazines, radio or television. It is true that professional societies in all fields are increasingly aware of keen public interest in their activities and achievements.

The Ethical Factor

The relationship of the physician to the media of public information is clearly stated in Chapter 1, Section 5, of the *Principles of Medical Ethics of the American Medical Association*, published in June, 1954.

> Many people, literate and well educated, do not possess a special knowledge of medicine. Medical books and journals are not always easily accessible or readily understandable.
>
> The medical profession considers it ethical for a physician to meet the request of a component or constituent medical society to write, act or speak for general readers or audiences. On the other hand, it may often happen that the representatives of popular news media are the first to perceive the adaptability of medical material for presentation to the public. In such a situation, the physician may be asked to release to the public some information, exhibit, drawing or photograph. Refusal to release this material may be considered a refusal to perform a public service, yet com-

* Modified for publication from unpublished material presented to the meeting of the Upper Midwest Chapter of the Biological Photographic Association in Des Moines, Iowa, November 12, 1955

pliance may bring the charge of self-seeking or solicitation.

An ethical physician may provide appropriate information regarding important medical and public health matters which have been discussed during open medical meetings or in technical papers which have been published, and he may reveal information regarding a patient's physical condition if the patient gives his permission, but he should seek the guidance of appropriate officials and designated spokesmen of component or constituent medical societies. Spokesmen should be empowered to give prompt and authoritative replies and a list should be issued which identifies them and discloses the manner in which they may be reached. These provisions are made with the full knowledge that the primary responsibility of the physician is the welfare of his patient but proper observation of these ethical provisions by the physician concerned should protect him from any charge of self-aggrandizement.

Scientific articles written concerning hospitals, clinics or laboratories which portray clinical facts and techniques and which display appropriate illustrations may well have the commendable effect of inspiring public confidence in the procedure described. Articles should be prepared authoritatively and should utilize information supplied by the physician or physicians in charge with the sanction of appropriate associates.

When any sort of medical information is released to the public, the promise of radical cures or boasting of cures or of extraordinary skill or success is unethical.

An institution may use means, approved by the medical profession in its own locality, to inform the public of its address and the special class, if any, of the patients accommodated.

The format and language of the more recent (1957) revisions differ, but the basic ethical concepts remain the same.

Varieties of Projects

Popularized versions of medical reports, papers and meetings have appeared more frequently since World War II than ever before. Motion pictures and network television programs which present general and specific medical subjects seem to have attracted great favor on the part of the public.

In the past, medical institutions were reluctant to issue public statements and did so only after the most careful deliberation, limiting such official statements to precisely phrased announcements in highly technical language. The reason for such caution was, in part, a tendency for members of the press to emphasize the name of the physician or to use phraseology which would lead the reader to assume that portions of the news accounts were the words of the physician or institution involved, rather than those of the writer of the news account. The appearance of such articles in public media sometimes was followed by unwarranted censure of the physician or institution by professional colleagues who were unaware of the true background of the incident.

For a number of reasons, some of these same institutions are now gradually adopting a somewhat modified attitude. For one thing, information judged to be beneficial to the public is more accessible in many fields, including medicine, and recognition of this fact is widespread. So far as medicine is concerned, photographs or diagrams can be provided to illustrate the statements, but the best

practice still requires that the subject or technic be reported in a recognized professional journal before either texts or illustrations are released to the public.

Recognition of the public's "right to know" has been a basic factor in an effort to assist local and regional medical societies properly to provide information to the public through the Public Relations Institute sponsored by the Public Relations Department of the American Medical Association since 1950.

When the illustration can be produced within the institution, the institution retains control of its use, if it is copyrighted. This is rarely done, however. Actually, so far as the release of photographs of patients to the press is concerned, or the permitting of newspapers and other agencies to photograph patients, current medical opinion is almost wholly against such a practice. It is wise, also, in the private practice of medicine, to withhold permission for the taking of photographs of offices in which patients are treated or laboratories by representatives of the press.

House organs produced or published by clinics and hospitals are increasing in number and improving in quality. House organs deal almost entirely with nonmedical subjects and are designed for circulation only to employees, members of the professional staff or professional colleagues. Usually included are pictures of department parties, group meetings, interdepartmental sports events, personality sketches and plain pictorial features which frequently have great value in enhancing relations between employees and employers.

Newspapers and radio and television stations very often ask medical groups or hospitals for photographs illustrating previously published scientific material or for photographs of members of the staff who have been signally honored by their colleagues, who retire from practice or who move from the city. The photographic department which can provide up-to-date and good-quality photographs to meet such requests will assist its institution in a public service which is now accepted and approved by the medical profession generally. This service also will help prevent the use of inaccurate, obsolete or unsuitable photography in the public news media, but a photographer should never release such material directly, regardless of who requests it. Facts or illustrations should be released only by an officially recognized spokesman of the institution.

Some hospitals draw attention to their needs for financial assistance or for employees who have special technical skills or aptitudes by the careful use of media which reach the public. Many times, well-prepared publicity releases illustrated by well-executed photography or art have been instrumental in obtaining research grants or outright gifts. One hospital is using an illustrated album or scrapbook as an agency in a campaign to obtain capital funds from large corporations and foundations.

Another hospital has used a plan which involves the photography of every newborn baby. Such a baby is photographed with its surname necklace in readable position and with the baby positioned in a special device which also records the sex, weight, date and time of birth, the parents' names and the name of the hospital. Exposures are made on large-size film, and the day after the birth the mother finds an attractive announcement card on her breakfast tray with congratulations from the hospital administration. Up to this point the program is one of *hospital* public relations

only, but in addition, the parents are encouraged to purchase additional announcement cards to be mailed to relatives and friends. Profits from the sale of these additional cards are used to purchase additional hospital nursery equipment, such as bassinets and incubators, and a resuscitator has been purchased from these revenues and given to the police and fire departments as a contribution to the community.

The historical value of photographs is now firmly established. A few examples will show the value of pictures for displays which commemorate anniversaries, reunions or other occasions. For a recent centennial celebration a photographic department of one institution was able to provide photographs for a 40-foot panel which constituted a pictorial review of the history of the community and its medical institutions. Another example was a display of illuminated color transparencies and legends which reproduced and explained the art program within a new medical building. Again, photographs of buildings, laboratories and personnel have been useful in illustrating informative booklets for employees or for visitors at "open house" or dedication ceremonies at new buildings. Photographs of this nature record conditions existing at the time, but will become part of a historical collection in the future.

Technical Factors

Obviously, several types of cameras would be suitable for this work. Probably the equipment on hand will be sufficient. For architectural studies of buildings, grounds, laboratories or offices a view camera seems to be the logical choice, since image size and correction of distortion can be controlled most easily with a view camera. For so-called candid pictures the press-type camera, the twin-lens reflex or the miniature camera is most satisfactory—the most adaptable one being the press camera in which a variety of sheet films or film packs is used. Color photography should be considered, since there are occasions on which the use of color in the reproduction of certain scenes may be considered justifiable. Miniature cameras are most useful and most adaptable for the production of 2 by 2-inch color slides. The motion picture camera similarly has become a most useful adjunct, since sound motion pictures of staff members or memorable events are being used increasingly to record these personalities or events, in some cases with a long range program in mind and in others for possible use in television presentations.

Either existing or tungsten light will be used for motion pictures. Existing light and flash are useful for still pictures. Some provision for multiple flash, either flash bulb or electronic flash, can be very useful in many situations.

Technics now in use in the studio or laboratory can be modified to give excellent results for nonmedical photography. A word of caution may be in order: when photographs to be reproduced for public view are made, extra effort is required to achieve a pleasing likeness. A poor likeness of a subject can do more harm than good, and can make the next approach to this subject more difficult, particularly if the unflattering picture has been published. An employee who is photographed with an unhappy expression will hardly convince the viewer that he is enjoying his work, his hobby or his retirement. The photograph actually must complement the adjoining text or story to be effective.

A filing system of prints and negatives with a ready cross-reference is essential

to smooth, errorless operation. File prints or prints which are supplied to publishers should have a file number or other notation on them to facilitate easy location of the negative. A cross-index to negative, print and identification of the subject will make the collection more useful.

Conclusions

In conclusion, it appears that the increasing interest manifested in many quarters in the problems and procedures of dissemination of beneficial medical and scientific information to the public from medical institutions, medical schools and professional societies has stimulated a similar interest in and a need for photography especially suited to such needs.

In most cases, control of the type and quality of photographs which are used for such purposes can be exercised best if the photographs are made by the institution which issues them.

Most photographic departments within such institutions are qualified to produce the work needed, so that with only slight modifications in equipment and technics, they can expand their activities to perform this useful service, thereby increasing the scope and enhancing the value of the department itself.

MEDICAL AND BIOLOGICAL ILLUSTRATION

CONTENTS

APRIL, 1959

Victorian Clinical Photography.

A Technical Close-Up Outfit . . . . . D. L. Cullen

Time-Lapse Film Study of Cell Reaggregation . . E. C. A. Lucey and A. S. G. Curtis

A Method of Vascular Display by Silver Impregnation . . . . P. S. Boulter and A. G. Parks

Plastic Animation in Medical Kinematography . . . . . H. J. Versteeg

Use of Films in Teaching Anatomy in the United States and Canada . . . . . J. E. Markee

Equipment and Methods:

- Johnson Optiscope 1000 MK II Projector.
- New Hand-drawn Letraset Faces.
- New Shading Media.
- Production of Monochrome Prints from Colour Transparencies by the Polaroid-Land One Step Process.

Annual Subscription $10.00

Published Quarterly by the

BRITISH MEDICAL ASSOCIATION

Tavistock Square, London, England

SEND ORDERS TO MEDICAL MARKET RESEARCH LTD., 280 MADISON AVENUE, NEW YORK 16, N.Y.

The Editorial Board of Medical and Biological Illustration. 1959

In 1950, when the work of launching this Journal was started, we were fortunate in obtaining the services of Dr. Peter Hansell as its first editor. Now, with the completion of the eighth volume, he has asked to be relieved of this office, and with regret the editorial board has complied with his wishes.

The present issue, the first of our ninth volume, seems a fitting place in which to acknowledge our debt to him, especially those of us who have served as his co-editors. *Medical and Biological Illustration* is established as the only journal of its type in the world, and the faith of the British Medical Association in backing what may have seemed a somewhat rash venture is surely justified. It is to Hansell that we must give our principal thanks for his firm and wise direction. His vision, and his understanding of the great diversity of techniques and applications of all forms of illustration in the medical and biological sciences has been responsible for the realistic yet imaginative service which this Journal has offered to its readers during the past eight years. We are happy that he is to continue as a member of the Board

We are glad to take this opportunity to welcome two new members to the Editorial Board. These changes and the appointment of a new editor and one co-editor make it desirable to publish a complete list of editors and editorial board members.

Editor

C. E. Engel	FIBP., FRPS., FBPA.	Chief Photographer to the Medical School, Guy's Hospital, London S.E. 1

Assistant Editors

Mrs. M. L. Johnson Abercrombie	B.Sc., Ph.D.	Research Fellow National Spastics Society
Robert O'Gorman Shaw	TD., MA., BM., MRCS., LRCP DMRD., FIBP., FRPS., FBPA	Director, Dept. of Medical Illustration Royal Infirmary, Manchester
Peter N. Cardew	MRCS., LRCP., FIBP., ARPS	Director, Photographic Dept Medical School, St. Mary's Hospital, London W. 2

Art Editor

Edward Smith		Artist, Dept. of Medical Illustration, Royal Infirmary, Manchester

Editorial Board

C. H. Barnett	MB., FRCS.	Reader in Anatomy St. Thomas's Hospital Medical School, London S.E. 1
W. F. Berg	D.Sc., Ph.D., D.Phil., F.Inst.P., FRPS	Head of Emulsion Group Research Laboratory, Kodak Ltd Harrow, Middx Principal, London School of Medical Photography
W. P. Blount	T.D., Ph.D., FRCVS., FRSE., FPH	Director of and Chief Poultry Adviser to The British Oil & Cake Mills Ltd., London E.C. 4
A. S. Curtis	B.A., Ph.D	Research Worker, British Empire Cancer Campaign University College, London W.C. 1

Peter Hansell	MRCS., LRCP., FIBP., FRPS., FBPA	Director, Departments of Photography & Illustration, Westminster Medical School and Institute of Ophthalmology University of London
H. R. Hewer	D.I.C., M.Sc.	Reader in Zoology, Imperial College, London
Norman K. Harrison	FIBP., FRPS., FRSA.	Photographer to the Royal Hospital of St. Bartholomew in the City of London
F. A. Jones	M.D., FRCP.	Physician, Dept. of Gastro-enterology Central Middlesex Hospital London N.W. 10
E. Stanley Lee	M.S., FRCS	Consultant Surgeon, Westminster Hospital Director of Surgical Studies Westminster Medical School London
Ronald Mac Keith	D.M., FRCP.	Physician, Children's Dept. Guy's Hospital London S.E. 1
R. McV. Weston	M.A., FRPS., FIBP., FBKS., FRMS.	Photographic Consultant, Director of Simpl Ltd. & Light Filters Ltd. London
Sylvia Treadgold	M.S.I.A.	Senior Medical Artist Guy's Hospital Medical School London S.E. 1 and Editor, British Medical Journal

Overseas Corresponding Members

Professor John Eggert	Dr.Phil., Dr.Ing., Hon. FRPS., Hon. S.P.S.E.	Director of the Photographisches Institut der Eidgenössischen Technischen Hochschule, Zürich, Switzerland; Recipient of the Gold Medal of the Photographische Gesellschaft, Vienna; of the Traill Taylor Medal, and of the Progress Medal of the Royal Photographic Society of Great Britain
Henry M. Lester	FRPS., FPSA., FSPSE., FBPA.	Photographic Consultant, 270 West End Avenue, New York 23; former editor and Co-Publisher of Photo-Lab-Index, Leica Manual, etc.
Lloyd E. Varden	FRPS., FPSA., FSPSE., FBPA.	Associate Professor in Graphics at Columbia University, New York; Photographic Consultant; former editor of the Journal of the Biological Photographic Association

BOOK REVIEWS

PRINCIPLES OF RADIOGRAPHIC EXPOSURE AND PROCESSING. *By: Arthur W. Fuchs Rochester, New York. Publisher: Charles C. Thomas, 301 E. Lawrence Ave., Springfield, Illinois.*

When this book was submitted to me for review, I was told by a fellow radiologist, "that the book was published 20 years too late and that with the development of phototiming and automatic film processing machines, the x-ray technician and the radiologist have no more need for such a detailed explanation of radiographic exposures". My answer to that comment is that the need for a thorough understanding of the principles of radiographic exposure and processing is even greater than before if the best results are to be obtained from these automatic machines. One has to have a complete knowledge of the various factors influencing the end result in order to exercise the proper control over the automatic devices on our radiographic and developing machines.

This book gives a clear cut description of the basic principles of radiographic exposure and has excellent illustrations of how all the various factors are involved in the production of good quality x-ray films. The chapters on x-ray film processing contain many important details that are essential in the step by step process of obtaining the best diagnostic film.

The author spells out very completely all of the factors that the x-ray technician has at his control in reducing the total x-ray dosage administered to the patient and still making it possible to obtain good radiographs.

This book fulfills the present day need for a thorough, clear-cut detailed presentation of the principles involved in obtaining good quality radiographs. The Glossary and the list of Reference Reading adds to the usefulness of the book as part of the library for the x-ray technician and the radiologist.

Irving I. Cowan, M.D.

THE SCIENCE OF PHOTOGRAPHY. *H. Baines. John Wiley & Sons, New York. 319 pp. 1958. $7.50.*

Small books are apt to be meagre and large books are good for reference. This small book happily falls inbetween with quite satisfying answers to almost any basic photography question. The following chapters indicate its scope: history, light, images, lenses, camera, light sensitive materials, development, fixation and stabilization, sensitometry and its practical use, reciprocity failure, color sensitivity and filters, after treatment of the negative, image grain, positive processes, tone reproduction, additive and subtractive color, color prints and masking, applications of photography, document copying and the future of photography. With the exception of having to get used to colour and a few Britishisms, the book is readable in terms of American materials. The book is well illustrated. Parts are marked off as "elementary science" to be skipped by the well informed and popular readers. It can be recommended as refresher reading for biological photographers.

O.W.R.

Association News

A section of the Journal devoted to official announcements, chapter events, and other matters of historical significance to the Association.

GENERAL NEWS

The Second Annual Western Regional Meeting of BPA was held on February 21 and 22 at the University of California in Berkeley. There were scientific papers and movies on the first day. Sam Ehrlich was moderator of the morning session and Lloyd Matlovsky of the afternoon session. In the evening was the Awards Banquet. The second day there was a "Scientific Exhibit Workshop" with Tom Masterson as moderator. It included conducted tours of the scientific exhibits of the California Medical Association Meeting and a discussion of design, layout and construction of an exhibit. There was also a salon which was the combined effort of local and National entries.

The first Midwestern Sectional Meeting is scheduled for April 24-26, 1959. It will be held in Iowa City and the Spring Board Meeting of the National BPA will be held in conjunction with this regional meeting.

The 29th Annual Meeting of BPA will be held in Montreal, Canada on August 31-September 3, 1959. The St. Lawrence Valley Chapter will be our host in this city of great historic interest and background. It will be the first Annual Meeting of BPA held outside the USA. Charlie Hodge is general chairman. We urge you to register now — by so doing you will save yourselves money and promise yourselves a rewarding and enjoyable trip to look forward to.

We hope soon to announce that the number of active chapters has grown from 18 to twenty. Two new ones are about to be born — Charleston, S.C. and Denver, Colo.

CHAPTERS

Boston: The February meeting was held at the Harvard School of Dental Medicine with John Withee of the Hitchcock Foundation in Hanover, N.H. as guest speaker. His subject was the preparation of exhibits in which he is well experienced. He described and showed slides on several he had recently prepared. The second half of the program was pure gravy. John showed us slides of his trip to Hudson Bay last summer. In March the group met at Children's Medical Center with Ferd Harding as host. The first half of the program was called "Pre-Flash Bulb Reminiscences" and Ferd told us interesting and most amusing incidents back in this P-F era. The second part of the program was a discussion of the Aristophot II and Ortholux microscope by Wolfgang Zieler. This instrument was recently purchased by Mr. Harding's Department of Visual Education.

Northern California: January and February were devoted to preparing for the Regional Meeting and it sounds as if a fine job was done by all. In March the meeting was held at the University of California Medical Center in San Francisco. Robert Brooks led a discussion and demonstration of the electronic microscope.

Southern California: New Officers for 1959: President Dick Ray, Vice-President Tom Masterson, Secretary Avis Gregersen, Treasurer William Martinsen. The January meeting was held at UCLA Medical Center where Howard Jones and Zane Price led a discussion on "What Makes for Quality in a Print". This chapter has been abstracting the Inter-Chapter Bulletins and sending copies to their entire mailing list. Things like this give the Chapters Committee courage for the future. Many thanks So. Cal. February was the Regional Meeting in Berkeley. In March the meeting was held at Santa Monica City College. Howard Jones, Instructor in Photography, was host. There was a tour of the department and a discussion of the equipment and methods he uses. Later in March was the first meeting of the newly formed "Photographer's Co-ordinating Council of Southern California". It was held in Hollywood with about eight participating photographic associations. Guest speaker was Loren Norcross of Brooks Photographic Institute in Santa Barbara. She spoke on "Print Quality". This co-ordinating council will be a clearing house for the exchange of ideas, projects of mutual interest, and co-operative print judging.

Chicago: In January, at the West Side V.A. Hospital there was a workshop on Electronic Flash with Don Comunale as guest speaker from Speedotron. The February meeting was supposed to be held at the George W. Colburn Laboratory, but unfortunately they went

out to strike a few days before the scheduled meeting. The meeting was changed to the Illinois College of Medicine where a business meeting and election of officers was held. The following were elected for 1959: President Leonard Hart, Vice-President Jack DeBruin, Treasurer Charles Lindsay and Secretary Evelyn Palmer. At the March meeting Mervin LaRue showed his film "Fire and Explosion Hazards with Flammable Anesthetics". He also gave a talk on animation and its relation to medical subject matter.

Central Indiana: The January meeting was held at the Indiana University Medical Center. George Cave presented a paper on "Sequence Photography". A movie was shown demonstrating time and motion study in the administration of tranquilizing drugs. In February Richard Scott gave a program on electronic flash and its adaptability to intra-oral photography. In March John Ridgely gave a talk and demonstration entitled: "Exposure and Processing of Ectacolor Printing Media."

Intermountain: The January meeting was held at the University of Utah. Dr. Robert Keyes spoke on "High Speed Photographic Techniques as applied to Detonation Phenomena in Explosives Research". At this meeting there was an election of officers as follows: President Gottlieb Schneebeli, Vice-President Robert Goodin, Secretary Richard Allen (Dep't. of Biology, U. of Utah, Salt Lake City), Treasurer Phil Bover. In February Dr. McNulty gave a demonstration of techniques of flower photography. Two films were shown: "Wonders of Plant Life" a Standard Oil of California Production, and a time lapse film by Dick Carman. In March there was a workshop on insect photography. William Nye lectured and a film "The Rival World" (Shell Co.) was shown.

New York: Sgt. Dixon came from Washington to speak at the January meeting. His subject was "New Techniques in the Production of Medical Motion Pictures". In February Roman Vishniac gave a talk on "The Cinematography of Life" and showed some of his fascinating films. There was also a workshop and discussion on emulsions used in photomicrography. Dick Carter and Percy Brooks led the way. At the March meeting H. Lou Gibson was guest speaker. He talked about "Clarity in Medical Photography" and showed slides and prints from the 1958 National Salon to illustrate his point.

Northern Ohio: In January there was a business meeting at St. Vincent Charity Hospital and officers were elected for 1959: President William Kubey, Vice-President Frank Minello, Secretary-Treasurer David Shields (2400 Overlook Rd., Cleveland Heights 6). The March meeting was held at Mt. Sinai Hospital with Bob Newhouse as host. David Shields led a discussion on the making of composite slides.

Prairie: January meeting was held at the V.A. Hospital in Topeka. Stanley McComb from the Mayo Clinic was guest speaker. His talk was entitled: "Critical appraisal of Photomicrographic Illustrations". There were some other presentations from the Washington meeting via tape recordings. In February, at Kansas City Dental School, there was a preview and discussion of prints for the salon in Iowa City.

St. Lawrence Valley: In January Lynn Wall of Eastman Kodak talked on "Special Techniques in Photomicrography". This included ultraviolet and polarized light, the photography of fluorescence and the phase contrast and interference microscopes. New officers for 1959 are: Chairman Dr. Alex Burton, Vice Chairman Otto Watzka, Secretary Harold Hicks (51 Elgin Ave., Valois, P.Q.), Treasurer Harold Coletta. Bernard Messier from McGill was the speaker at the February meeting. He talked about autoradiography technique for tracing the fate of chemical compounds in living tissue. At the March meeting Stanley Klosevych of the Bio-Graphic Unit in Ottawa gave an illustrated lecture on "The Photography of Macro and Micro Specimens". He dealt particularly with optics and lighting for macro and micro work.

Upper Midwest: Our National Vice-President and Barbara Allison also of the V.A. Hospital, were awarded a special certificate by the A.M.A. in San Francisco for the best medical illustration in connection with the exhibit "Upper Dorsal Sympathectomy".

Western New York: Acting Chairman and Vice-Chairman of this newly reorganized chapter is Marjorie Jacobson. Secretary-Treasurer is T. Lyle Keith (Children's Hospital, 219 Bryant St., Buffalo 22). In January Dr. Samuel Sanes, Professor of Legal Medicine at the University of Buffalo, spoke on "The Medical Investigation of Crime". There was an inspection tour of the new Central Photographic Laboratory of the E. J. Meyer Memorial Hospital.

Wisconsin: New officers for 1959: President George Spuda, Vice-President Bob Teevan, Secretary-Treasurer Rita Perrick.

L. B. BROWN, *Chairman Chapters Committee*, 188 Longwood Ave., Boston 15, Mass.

New Products

COLOR QUALITY OF PROJECTED PICTURES IMPROVED WITH NEW ENTECO TRANSPRO PROJECTION FILTER ATTACHMENT FOR MOVIES OR SLIDES

ENTECO'S Transpro Projection Filters will give to slides or movie films the proper color balance by either increasing or decreasing the [illegible] ted filtering that was needed at the time the pictures were taken.

[illegible] naturalness that makes it subjectively more

pleasing. This is accomplished by one filter which increases the color temperature of the [illegible] projector, and the other which decreases the color temperature.

The filters must be spectrophotometrically exact so that with the "warming" or "cooling" of the pictures, the color balance is effectively maintained within close limits. This is important because should the filters be off the slightest bit, the effectiveness is nullified. That is why ENTECO'S rigid quality control is so [illegible] Transpro Filters:

The two Transpro Filters on the Attachment are each metal mounted to withstand hard usage. A flip of the finger either positions or removes the filter from in front of the projection lens. The Prices are:

For Movie Projectors

Size	8mm	16mm
Price	4.95	[illegible]

For Slide Projectors

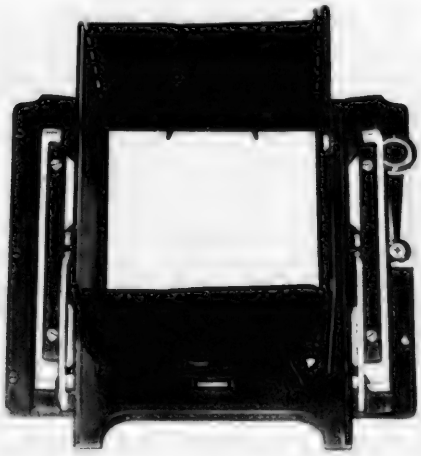
[illegible]

COLOR TV TECHNIQUES IMPROVE MOTION PICTURE AND STILL PHOTOGRAPHY

Methods of applying color [illegible] a color negative. This picture will match [illegible] sired density and color balance by providing instantaneous exposure data for the entire film and for area masking as well. It also allows for full use of the large tolerance in negative color film to offset poor exposure.

The Hazeltine official revealed that a prototype model of the Analyzer had been used by several large motion picture film processing laboratories, which reported excellent [illegible]

Hazeltine, founded in 1924, has been a pioneer in the development of radio, television, color television and other electronic systems.



TEL-AMATIC 16/35 mm. NEGATIVE/ POSITIVE CLEANING MACHINE

the magazine and replaced in seconds.

vides the traction to move the film rapidly

slip clutch and micro-switch triggered by release of film tension, similar to a buckle-trip in a professional camera. This combines to automatically halt the supply reel when it is emptied and act as a safety device if a splice should part.

The dry area houses three jets and squeegees apart from the wet section, all of which are accessible from the rear.

TEL-Amatic is completely enclosed so the work can be viewed while in progress. All film rollers are ball bearing or free running, picture film or microfilm can be used. The film is guided by its edges and the never touch the image area. Only the make physical contact with the film surface.

are: 22 inches wide by 24 inches deep by 72 inches high. Weight: 420 pounds. The base of TEL-Amatic has casters for complete mobility. All parts are located on a recessed panel. Behind this panel is the motor, pump and compressor area. The transmission is driven by silent timing belts for a non-slip drive. An access door provides easy access

S.O.S. Filmlation throw the switch and TEL-Amatic does the rest. One gallon of lotion

An internationally known Film Optical Laboratory recently ran 17,000 feet of the softest emulsion film known through their TEL-Amatic Film Cleaning Machine. The results: The film came out in excellent shape without scratch-

erate a battery of TEL-Amatic Cleaning Ma-chines—a great labor-saver. Space requir-

HERSHEY ANNOUNCES LOW COST PROFESSIONAL SPEED LIGHT

The first heavy duty electronic flash unit available at an economical price for profe sional photographer use has just been an nounced by Hershey Manufacturing Co. Chicago, exclusive manufacturers of high quality speed lighting. Called the "Hi-Pro", the flash unit is said to put out a remarkable amount of light for large areas at a cost of approximately 50c per watt-second of light output.

Latest in the Hershey firm's complete "Sun Lite" line, the new "Hi-Pro" claims 150 watt seconds of light output over a broad beam width. The unit is rated a Kodachrome Guide

a convenient outlet on each unit, eliminating

The new Hershey Sun-Lite III-Pro Electronic Flash Unit weighs 4 lbs., measures 6"x6"x8" ture may be obtained direct from the manu- West Lake Street phone MAnsfield 6-2612.

EDNALITE MAGNIFINDER FOR CRITICAL FOCUSING WITH REFLEX . . . GROUND GLASS BACK CAMERAS

The EdnaLite Optical Company, Inc., of Peekskill, New York announces the availability of a precision instrument THE EDNALITE MAGNIFINDER, which is designed for critical examination of all types of projected,

It is instantaneous, for taneous, critical focusing with any reflex or By ing directly against and in contact with the face to be viewed, THE EDNALITE MAGNIFINDER eliminates squint and all other focus-

age sharp to the extreme edges.

ers of PHOTOMICROGRAPHY and ment is a most valuable tool.

NEWTON RINGS ENTIRELY ELIMINATED WITH LINDIA MOUNTS

etched NEWLO "Newton-ring-free" glass

by providing for the free flow of air between thin and protective glass, the etched surface prevents all moisture condensation, thus non known as the NEWTON ring.

NEWLO glass is extra thin and for rendition. The glass comes pre-cleaned and precision ground to closest tolerances, for a snug fit in the lightweight plastic-mixed-with-metal LINDIA snap-in mounts. And it takes up to a saving of many precious hours of labor.

The smooth shape and patented snap-lock ing apart and guarantee absolutely trouble be re-opened and re-used any time.

Distributed in the U.S. by Karl HEITZ, Inc. 480 Lexington Ave., New York 17, N.Y. glass and $2.5 of 1/8" with regular glass.

CONTRIBUTING MEMBERS

Dean C. Altman
A. Andreeko
Robert F. Albright
Anonymous
Dr. Edgar C. Baker
E. Lynn Baldwin
Donald L. Bechard
John J. Beiter
Tibor Benedek, M.D.
Lester V. Bergman
Leland Bowerman
Laurence B. Brown
Robert A. Brown
M. Bigelow Browning, M.D.
Joseph D. Brubaker
Perry Burgess, Jr.
Dr. Ralph Buchsbaum
William J. Cameron
William H. Campbell
Julian Carlile
Lardner Coffey
Philip A. Conrath
Howard Cradick
Joseph R. Dant
S. Jack David
C. G. de Gutierrez-Mahoney, M.D.
Stephen P. Dittmann
P. K. Duraiswami, M.D.
C. Graham Eddy
Edward Entin
Dr. E. J. Farris
Jack Fason
Louis Paul Flory
A. Wilson Footer, M.D.
Jay T. Fox
John A. Gaughan
Boas E. Gibson
Zygmunt Gierlach, M.D.
D. M. Glover, M.D.
F. W. Goro
Alex A. Gravesen
Avis Gregersen
Richard D. Grill
Ferdinand R. Harding
Leslie E. Hier
Rudolph J. Henning
David Hilbrand
Constance Holland
Nathan S. Horton
Joseph T. Jackson
Homer Jones
V. M. Jordan, M.D.
M. George Jorgenson
Leonard A. Julin
Nathan C. Kantor
John Kozie
T. C. Kramer
J. F. Kuzma, M.D.
Victor R. Landi
John M. Langton, M.D
Thomas J. Lannon
Pierre J. LeDoux
Henry M. Lester
Albert Levin
K. Cramer Lewis
Gerald M. Lindley
R. P. Loveland
David Lubin
James F. Mahaffey
Francis C. Mallory
Robert Mallory III, M.D.
William L. M. Martinsen
Leo C. Massopust, Sr.
Thomas Masterson
Richard G. McClure
Edward C. McGarry, M.D
Leslie McWilliam
Julius S. Mesiar
Erwin Miller
Bernard J. Moore, Jr
Robert M. Moore, Jr.
Henry W. Morris
Alex V. Mucha
Leonard Perskie
Dorothy M. Pinkham
William Poremba
Arthur Proetz, M.D.
Dr. William Quijano
Richard H. Ray
Chester F. Reather
George W. Reis
Dr. Oscar W. Richards
Robert A. Sage
Bernard Salb
Dr. Richard C. Schiller
Sidney Shapiro
Anne Shiras
Paul J. Showstark
Dr. Fred Sielaff
Stanley D. Simmons
William Stevenson
Warren Sturgis
Joseph W. Tandatnick, M.D.
Marion Tappan
W. Jackson Taylor
William J. Taylor
Dr. Harvey E. Thorpe
Howard T. Toenniges
Howard E. Tribe
Lloyd E. Varden
Dr. Roman Vishniac
Julius Weber
Leonard Winograd
Thomas L. Wood
Verlin Y. Yamamoto
Stella Zimmer

SUSTAINING MEMBERS

AGFA INCORPORATED
AMERICAN SPEEDLIGHT CORP.
ANSCO
ARKAY CORPORATION
CHARLES BESELER CO.
BRINKMANN INSTRUMENTS, INC.
E. I. du PONT de NEMOURS & CO.
EASTMAN KODAK CO.
ELGEET OPTICAL CO., INC.
EMDE PRODUCTS, INC.
EXAKTA CAMERA CO.
W. J. GERMAN, INC.
GRAFLEX, INC.
KARL HEITZ, INC.
KERN CO.
KLING PHOTO SUPPLY CORP.
POLAROID CORPORATION
POSTGRADUATE MEDICINE
J. G. SALTZMAN, INC.
SANDERS LABORATORIES, INC.
SIMMON BROS., INC.
S. O. S CINEMA SUPPLY CORP.
WILLOUGHBYS

FELLOWS of the ASSOCIATION

HAROLD C. BAITZ
JOHN J. BEITER
DR. ARTHUR D. BENSUSAN
PERCY W. BROOKS
LAURENCE B. BROWN
CHARLES G. BROWNELL
JOSEPH D. BRUBAKER
JOHN V. BUTTERFIELD
JULIAN CARLILE
LARDNER A. COFFEY
RALPH P. CREER
JANE WATERS CROUCH
J. W. CRUNELLE
CAPT. STEPHEN P. DITTMANN
S. C. DUNTON
C. GRAHAM EDDY
CHARLES E. ENGEL
DR. EDMOND J. FARRIS
LOUIS PAUL FLORY
JAY T. FOX
ARTHUR W. FUCHS
JAY M. GARNER, M.D.
H. LOU GIBSON
ALEX GRAVESEN
AVIS GREGERSEN
JULIUS HALSMAN
ALLEN HANCOCK
DR. PETER HANSELL
FERDINAND R. HARDING
CHARLES P. HODGE
PAUL H. HOLINGER, M.D.
JOSEPH HOMAN
NATHAN S. HORTON
MARIA IKENBERG
LEONARD A. JULIN
FRED W. KENT
THOMAS J. LANNON
MERVIN W. LaRUE
PIERRE J. LE DOUX
HENRY M. LESTER
ALBERT LEVIN
CHARLES LINDSAY
ROGER P. LOVELAND
DAVID LUBIN
ADOLPH MARFAING
WILLIAM L. M. MARTINSEN
LEO C. MASSOPUST, SR.
I. L. MATLOVSKY
JOHN A. MAURER
STANLEY J. McCOMB
HENRY M. MORRIS
DR. ROBERT OLLERENSHAW
WILLIAM F. PAYNE
LEONARD L. PERSKIE
DR. ADRIANUS PIJPER
DR. ARTHUR W. PROETZ
CHESTER F. REATHER
DR. OSCAR W. RICHARDS
MAURICE N. RICHTER, M.D.
HENRY ROGER
DR. GEORGE L. ROYER
ROBERT A. SAGE
SIDNEY SHAPIRO
ANNE SHIRAS
WILLIAM STEVENSON
WARREN STURGIS
WILLIAM J. TAYLOR
HOWARD E. TRIBE
HARRIS B. TUTTLE
LLOYD E. VARDEN
ROMAN VISHNIAC
JULIUS WEBER
JOHN E. WITHEE
VERLIN Y. YAMAMOTO
H. WOLFGANG ZIELER
STELLA ZIMMER

FELLOWSHIP PROCEDURE

Members may propose for Fellowship in the BPA other members whom they consider worthy of recognition. To be eligible for Fellowship a candidate must have been a member of the Association for five consecutive years and must possess one or more of the following qualifications:

Superior craftsmanship in still or motion picture photography of biological subjects.

Ability in photographic research in new methods or materials.

(These require submission of evidence.)

Meritorious contributions to biological photography overall through sustained organizational work.

Two sponsors are required. The sponsors should be well acquainted with the candidate's work and ready to furnish the Board with details of his experience and achievements. Those who wish to sponsor a member whom they believe to be eligible should request a Fellowship Application form from the Secretary of the Fellowship Committee: Mrs. Maria Ikenberg, University of Illinois, 904 W. Adams Street, Chicago 7, Illinois.

CONTENTS

JOURNAL OF THE BIOLOGICAL PHOTOGRAPHIC ASSOCIATION

Volume 27, Number 1 — February, 1959

APPLICATIONS OF AUTORADIOGRAPHY IN BIOLOGICAL RESEARCH . . N. L. Dockum, G. S. Vogt, and E. J. Coleman 1

FILM CHARACTERISTIC CURVES USING THE DENSICHRON AND GRAY SCALE CHIPS SUPPLIED WITH THE DENSICHRON REFLECTION UNIT . . . . . Preston F. Gott 19

PRE-PRINT PREPARATION OF 16MM MOTION PICTURES . . . . . Allen Hilliard 27

NONMEDICAL PHOTOGRAPHY IN A MEDICAL INSTITUTION . . . . . Ervin W. Miller 33

THE EDITORIAL BOARD OF MEDICAL AND BIOLOGICAL ILLUSTRATION, 1959 39

BOOK REVIEWS 41

ASSOCIATION NEWS 42

NEW PRODUCTS 44

CONTRIBUTING MEMBERS 48

SUSTAINING MEMBERS, FELLOWS OF THE ASSOCIATION, FELLOWSHIP PROCEDURE . . . . . Back Cover

PRINTING BY HAMMERSMITH-KORTMEYER COMPANY, MILWAUKEE, WISCONSIN

2

JOURNAL BPA OF THE

Biological Photographic Association

Dedicated to the Science, Techniques and Applications Pertaining to the Photography of All Things Which Live or Which Have Lived

QUARTERLY OF THE BIOLOGICAL PHOTOGRAPHIC ASSOCIATION, INC.

Volume 27, Number 2 May 1959

JOURNAL *of the* BIOLOGICAL PHOTOGRAPHIC ASSOCIATION

EDITOR

EDITOR . . . . . LEO C. MASSOPUST

ASSOC. EDITOR . . . . . STANLEY WEINREB, Ph.D.

Marquette University
School of Medicine

Milwaukee 3, Wisconsin

EDITORIAL POLICY

Manuscripts should be sent to the Editor in legible form on 8½" x 11" paper, preferably typewritten, double spaced, with 1¼" margins on both edges as well as top and bottom.

Tables should be on separate sheets, each with self explanatory captions.

Reference notations in the text should be written as superscripts. Do not place in parenthesis. References should be on sheets separate from the text, numbered consecutively in the order of their appearance in the manuscript. Journal references should include: Author(s), title of article, volume number, page number(s), month and year. Book references: Author(s), title of book, edition, page number(s), publisher, year. Double space lines, triple space between references, 1¼" margins.

Illustrations should accompany the manuscript, preferably unmounted. They must not be larger than 14" nor smaller than 4" in maximum dimension, and should be properly proportioned to fit single column, double column or full page of the Journal. Identify each illustration on its back in soft blue pencil, giving title of paper, senior author and Fig. No. only. Legends should be on a separate sheet and each identified by Fig. No. matching its illustration. Double space lines, triple space between legends, 1¼" margins.

The editors reserve the right to reject manuscripts considered unsuitable. Major alterations of accepted manuscripts will not be made without permission of the senior author.

Special Note: If you have an idea or technique of importance to biological photography and need assistance in preparing the manuscript, write Editor.

OFFICERS OF THE ASSOCIATION

President — Leo C. Massopust, Sr., FBPA
Marquette University
School of Medicine
Milwaukee, Wis.

Vice President — Verlin Y. Yamamoto, FBPA
Medical Illustration Service
Veterans Administration Center
Des Moines 9, Iowa

Secretary — Jane H. Waters, FBPA
Grand Central P.O.
Box No. 1668
New York 17, N.Y.

Treasurer — Albert Levin, FBPA
University of Pittsburgh
Health Professions Bldg.
A-V Photo Service
Pittsburgh 13, Pa.

Opinions expressed by authors are not necessarily those of the Biological Photographic Association.
Copyright, 1959, by Biological Photographic Association, Inc.

OFFICIAL PUBLICATION OF THE BIOLOGICAL PHOTOGRAPHIC ASSOCIATION, INC.

Published at 733 North Van Buren Street, Milwaukee 2, Wisconsin. Editorial office: Box 1668 Grand Central P.O., New York 17, N.Y. Entered at the Post Office, Milwaukee, Wisconsin, under the act of March 3, 1879. Subscription price $9.00 per volume; foreign $9.50. Single copies $2.25 in the U.S.A.; foreign $2.40 in U.S.A. funds.

Autoradiography of Electrophoretic Starch Gels Containing Fe^{59}.

ROSS JACKSON,
bio-Graphic Unit, Scientific Information, Research Branch,
Canada Agriculture, Ottawa.

AUTORADIOGRAPHY is a method by which radioactive substances, either natural or induced, are made to exhibit their locations within other structures by their influence on photographic emulsions. The bombardment of atoms of various elements results in unstable nuclei, which, while endeavouring to regain their natural state, emit alpha and beta particles and gamma rays.[1] This process renders silver grains in photographic emulsions developable, and information is gained either by the blackening of single grains, usual with microsections, or as clumps of developed grains, as in this case

Problem with Starch Gels

The permanent recording by autoradiographic techniques of the position of blood serum proteins, containing radioactive iron, Fe^{59}, half-life 47 days, in electrophoretic starch gels, presents the problem of obtaining the required information within the shortest possible time. The reason for this is that the radioactive bands, which occur during electrophoresis, disperse quite rapidly within the unstained gel. If the band locations are to be shown distinctly this limits resolution, and necessitates relatively short exposures which also affect density. Greater density to facilitate copying can of course be obtained with increased exposure time, in the order of three or four days. However, the dispersion occurring during this period results in "clump images", which are caused by the "scattering" of the bands, and these lack accurate location as mentioned above

Tests

As radioactive iron is a gamma ray emitter, X-ray film was the logical choice as a sensitive material Figure 1. X-ray and gamma rays, being "hard" or penetrating, require thicker or more

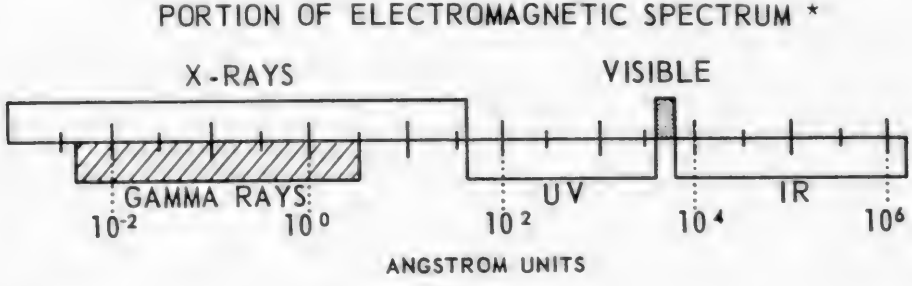


Fig. 1.

Received for publication January 8, 1959.
*from: "Radiography in Modern Industry", E. K. C.

concentrated emulsions.[2] This ruled out visible light and nuclear emulsions. Both of these are sensitive to gamma radiation, the latter being only 1/100 as sensitive as double-coated X-ray emulsions.

As no information could be found on possible exposures for Fe^{59} under these conditions, test papers were prepared containing various concentrations of radioactive iron, and autoradiographic test exposures made from these Figure 2. The concentrations consisted of

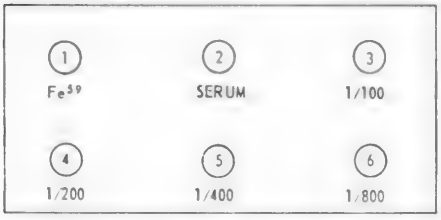


Fig. 2. Droplet placement.

droplets, 1/20 ml., placed on filter paper in the order shown. Spot 1 was undiluted radioactive ferrous sulphate solution 100μc per ml. Spot 2 was the blood serum under test in the gels plus .05μc of Fe^{59} per ml. Spot 3 was 1/100 that of 2, spot 4, 1/200; etc. as illustrated.

Test exposures were made on Kodak Industrial X-ray film Type AA. This material was chosen for its relatively high speed, high contrast and fine grain and was processed in X-ray developer for 5 min. at 68° F. The filter paper and sensitized material were separated by a sheet of "Saran" (Dow Chemical Co.) as this barrier was required when working with the actual gels, as will be explained later. Exposures of one and five hours duration were made and the results read on a densitometer (Table 1). No data is shown for spots which were either invisible or too thin for accurate readings.

TABLE 1

Exposure	Fe^{59}	Serum	Background 1/100	Den.
one hour	.56	.31	—	.28
five hours	1.53	.40	.30	.29

The serum spot containing the concentration used in the gels had a reading of .40, or .11 above background for the five hour exposure. It was felt that double this exposure would be adequate for the actual gels, as the strength of the radioactivity would be diminished somewhat due to the thickness of the gels, which was about 3/16".

Gel Procedure

The final autoradiographs were made by placing the film in contact with the gel in its lucite carrier Figure 3. As the gel must be maintained in a moist condition to prevent shrinkage during exposure, "Saran" is taped over the exposing surface and any bubbles or wrinkles are smoothed out. This layer is important as artifacts are sure to occur in the emulsion, which will either confuse or nullify the information obtained. This material allows a gamma ray transmission of 85 to 90%.

Fig. 3. Exposing "sandwich".

An exposure of ten hours was given and processed as above. This exposure resulted in a density of .35, .06 above background which was adequate for visual evaluation but was too low from a reproduction standpoint. It does not follow that doubling the exposure of the test doubles the density because of the diminishing emission rate plus the

Fig. 4. 72 hour exposure.

dispersion factor. Appreciably increasing exposure to achieve greater density resulted in poor resolution of the bands, as explained earlier. Figure 4, which was exposed for 72 hours, illustrates this point. The spot density of the autoradiograph was 1.10, .81 above background. Also, this exposure was made after the gel was stained, which reduces the radioactivity by about 50%.

Reproducing the Autoradiograph

Because of the low density of the result of the ten hour exposure, normal procedures for reproducing it were not possible due to the lack of contrast. Also an intermediate "positive" had to be made to maintain tone relationships as they occurred in the original so they could be evaluated in their usual terms. This was accomplished by photographing the autoradiographs by transmitted light on an X-ray illuminator, reading 150 foot-candles at its surface. They were copied same-size on high contrast line film, (Kodalith, Reprolith or similar material) and processed in undiluted D-72 Dektol for 1½ min. at 68° F. This film was used to gain the required contrast in the copy; but as the recommended developer for this material reduced the area of the bands and D-72 caused no change, the latter was used. A print for reproduction was made by contact on No. 4 paper, Figure 5. This print gave the maximum information possible.

Because of its original density, Figure 4 was copied by the usual techniques on continuous tone material. Kodak Gravure Copy Film was used and exposures made by contact in a vacuum frame, and processed as recommended in D-11. Copying by contact of double coated X-ray film would ordinarily result in loss of definition. However, in this particular case, definition is not sac

Fig. 5. 10 hour exposure.

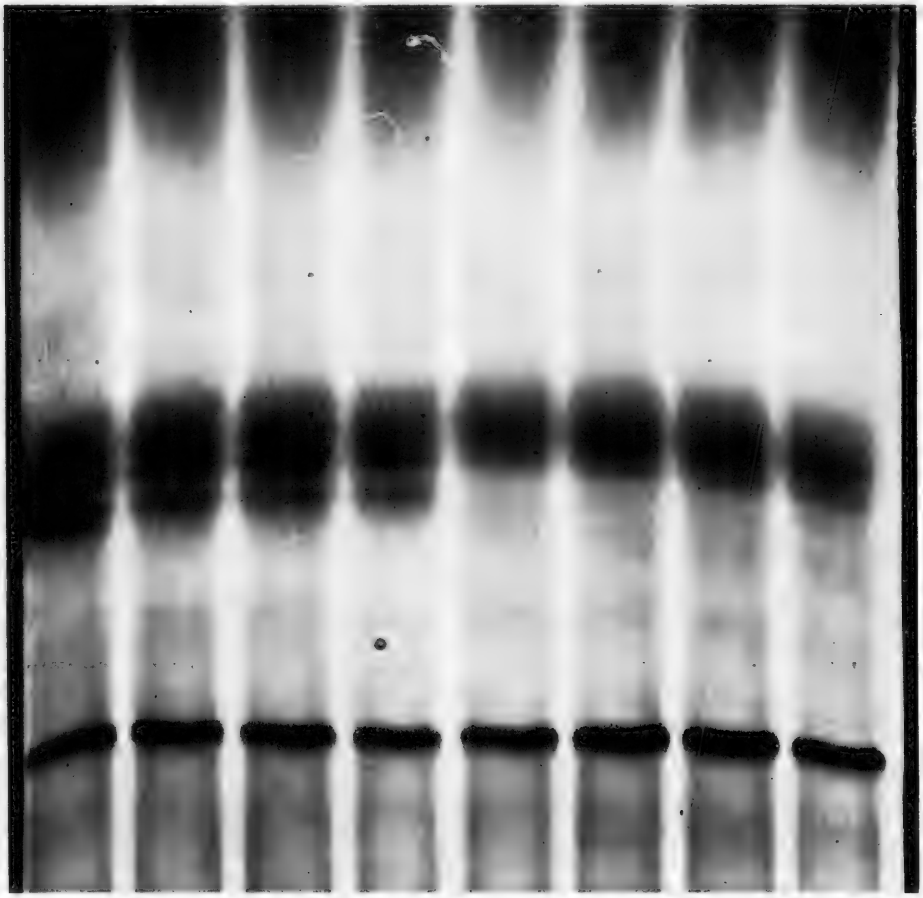


Fig. 6. Straight photograph of stained gel.

rificed to any great degree because of the lack of same in the original.

Stained Gels

Record photographs of stained gels are required for purposes of comparison. The staining of the starch gel with Anido Black 10B makes the locations of the proteins visible. The stained gel, Figure 6, was photographed under a solvent, methanol, glacial acetic acid and water, to inhibit shrinking and surface ridging, on panchromatic film with a Wratten No. 25 filter, processed as rec ommended and printed normally. This was stained after Figure 5 was made and dispersion is quite evident.

Acknowledgement

This work was conducted in connection with genetic studies of the Animal Research Institute, Canada Agriculture, and the author would like to thank Dr. Charles Hickman for his help with the preparation of this paper

REFERENCES

1. Bourne, G. H. "Autoradiography" Brit. Med Bull. Vol. 8, 1952
2. Boyd, G. A. "Autoradiography in Biology and Medicine". Academic Press, N. Y. 1955, p 18
3. Herz, R. H. "Photographic Fundamentals of Autoradiography." Nucleonics, September 1951, p. 28

Journal of the Biological Photographic Association Vol. 27, No. 2 May, 1959

Photography Through the Stereoscopic Microscope

JOHN E. PETERSON

Assistant Professor of Botany,
University of Missouri, Columbia.

A NUMBER of persons have come to my laboratory during the past school year to inquire about, and to observe, my methods of photographing small, opaque objects in color through the stereoscopic microscope. These persons have been zoologists, geologists, bacteriologists, microbiologists, and workers in various medical areas, in addition to those in my own field, botany. Color transparencies of very small organisms which I have used to illustrate papers and lectures have invariably brought questions as to how they were made. Consequently, I believe that there is interest in photography of this type by a wide spectrum of scientists. Hence the motivation for this paper.

Technically, I am a very poor photographer, although I have been a successful picture-taker for some years. The very fact that I am not a photographer indicates that anyone can use the procedures to be discussed and that anyone can get comparable results.

I do not consider most of the entities to be discussed in this paper to be original with me, but these details have apparently never been brought together and discussed in print where interested workers can find them. Actually, I have been quite surprised to find so much interest in my photography. For the seven or eight years that I have been photographing in this fashion, I have been inclined to accept it as a routine method of recording information. I would like to give much recognition to Dr. Constantine J. Alexopoulos, now Chairman of the Department of Botany, State University of Iowa. He introduced me to photography through the stereoscopic microscope several years ago when I was a graduate student under his direction at Michigan State University. The basic pattern is his, to the best of my knowledge, although I have made some refinements and given the procedure considerable thought. Undoubtedly, other workers in various areas have used similar methods to obtain comparable results.

Clarification of the meaning of the title of this discussion is immediately necessary. The photography in question utilizes the stereoscopic microscope as a source of magnification, but no implication of stereoscopic properties in the finished product is implied. The completed photograph is either an ordinary transparency or a print and has no more illusion of depth than one gets when using a single ocular of a stereoscopic microscope.

Applications and Uses

Photography through the stereoscopic microscope may be utilized to photo

graph opaque and translucent objects when magnifications greater than those obtainable with extension tubes, portrait lenses, telescopic lenses and other such devices are necessary. Optical systems producing magnifications from 10X to a maximum of 90X have been used, but the real value of this photography appears when magnifications greater than 30 or 40X are required.

Reflected light has been used on all opaque objects, on most translucent objects, and on many transparent objects. The greater proportion of the following discussion concerns the use of reflected light. Objects only 40-50μ in size have been satisfactorily photographed in reflected light. Myxomycete, myxobacterial and fungus fruiting structures, tiny fossils, small insects, nematodes and other minute animals, and various plant and animal structures have been photographed through the stereoscopic microscope with reflected light.

Transmitted light has been used occasionally to photograph such transparent and translucent objects as gross tissue sections, minute worms and insects, and fungus and algal structures. Such photographs sometimes have been superior to those attainable with the compound microscope. Photography through the stereoscopic microscope with transmitted light may be advantageous to photomicrography through the compound microscope when: (1) magnifications in approximately the 30X to 100X range are required and low power oculars, low power objectives, or Micro Tessar type objectives would have to be used; and (2) the specimen will lose much in being flattened and mounted as it must be for compound microscopy. No implication that photography through the stereoscopic microscope utilizing transmitted light is a general replacement for photomicrography with the compound microscope is intended. However, on occasion, for certain specimens and preparations which do not lend themselves to usual photomicrography, such procedures may be advantageous.

Equipment and Materials

I have been using the equipment in the arrangement shown in Fig. 1 for the past five years with success. Comparable instruments, made by other manufacturers, certainly could be substituted. The total equipment needed, as shown in Fig. 1, consists of a standard research-quality stereoscopic microscope, a light source, a light meter adapted to fit the body tube of a microscope, and a single-reflex camera.

The light source shown in Fig. 1 is a Bausch & Lomb housing containing a G.E. 200W, spiral-filament, bayonet base, projection bulb. The bulb casualty is sometimes heavy because of the angle at which it is used. However, the one in the lamp in Fig. 1 has been used for well over two years and many hundreds

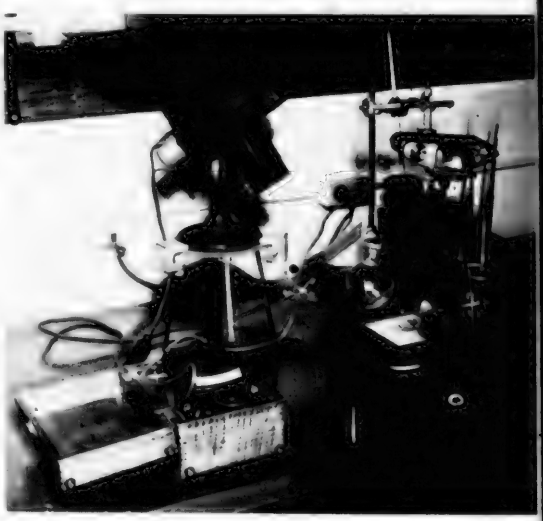


Figure 1

of hours. The light in the arrangement in Fig. 1 is beamed through a diffusion plate, then through a flask of ordinary water. Use of the diffusion plate results in much smoother light, but it also reduces the intensity and, consequently, it is sometimes removed for high magnification work. The water flask has three functions: (1) it serves as a cooling cell so that specimens will not be damaged, or destroyed, by heat; (2) it is a condenser to concentrate the light to a small area; and (3) it diffuses and smooths the light. The light source described may have many shortcomings and is far from ideal for photography through the stereoscopic microscope, but it has given satisfactory results.

The light meter shown in Fig. 1 is a Photovolt, Model 200M. Whereas I find a light meter quite indispensable for photomicrography with the compound microscope, I believe that it could be dispensed with for photography through the stereoscopic microscope. This statement is made because the wide variations in backgrounds and substrates on which specimens being photographed are found cause tremendous reflections and refractions in the light finally entering the microscope. Consequently, it has not been possible to truly standardize the light in terms of meter readings, and compensations in exposure time in terms of light intensity are often necessary. Nevertheless, the light meter has always been used as an initial reference point.

There is little to discuss concerning the actual microscope. The one shown in Figs. 1 and 2 is an American Optical Company, Model 25, with 1X, 3X and 6X objectives. When equipped with 15X oculars, as it usually is, magnifications of 15, 45 and 90 diameters are available. Oculars of lesser magnification may be used to provide intermediate

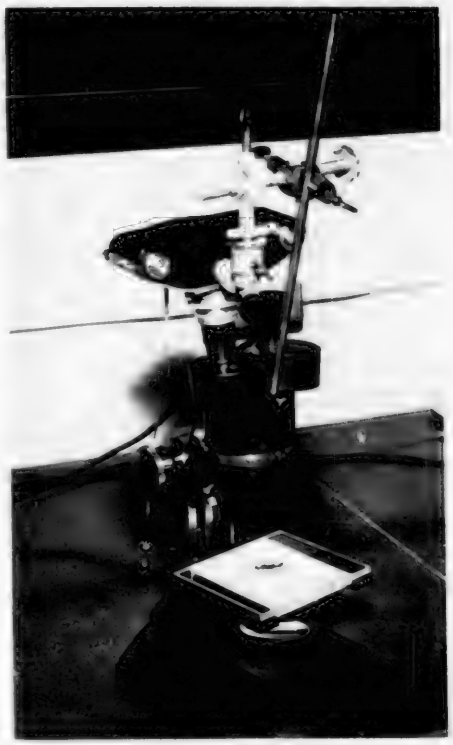


Figure 2

magnifications. A microscope with a straight binocular body, rather than an inclined body, is preferred for photography because it is easier to attach the camera to the vertical tube. Any sturdy, standard stereoscopic microscope should be acceptable if it provides adequate magnification and if the camera can be readily attached to it.

The attachment of the camera to the microscope, as shown in Fig. 2, is accomplished by means of a "Rube-Goldberg" series of rods and universal joints. Any arrangement that securely attaches the camera to the body of the microscope so that focusing the microscope also moves the camera is satisfactory.

A Kine-Exakta II camera, shown in Figs. 1 and 2, has been used with

considerable success for photography through the stereoscopic microscope. This same camera has also been used routinely in photomicrography on the compound microscope. The major advantage of this camera for this work is that it has a single-reflex action so that the specimen being photographed can actually be focused (with the microscope focusing adjustment) directly onto the plane of the film and this focusing can be critically inspected on the ground-glass viewing screen of the camera. There are now other single-reflex cameras available and I suspect that some, if not all, of them could also be utilized for this work.

The lens on the camera is a Zeiss Tessar f3.5 and happens to fit exactly over a standard microscope ocular. Some other lenses used on Exakta cameras, particularly the faster lenses on newer models, are of other sizes and this cannot be done. In such cases, a connecting sleeve of some sort is necessary to attach the camera to the ocular. The lens has always been completely open and set at infinity when used on the stereoscopic microscope.

Exposure times have been determined by trial-and-error comparisons against varying light intensities until a reasonable standardization has been attained. Exposure times have ranged from as low as 1/5 of a second for low magnifications to 6 seconds for high magnifications, with about 3 seconds being most satisfactory for the majority of cases. The Exakta camera has a 12-second lag mechanism before the shutter opens which is very useful for this type of work. This mechanism can be set off, the operator can withdraw from the camera and microscope, thus reducing vibration to a minimum, and, after 12 seconds, the shutter opens for the desired period of time.

I have used color film almost exclusively. I have found Kodachrome Professional Type A 35mm film (KA 135) to be the most satisfactory for my work with my particular light source and apparatus, although other workers get excellent results with other color films and with black and white film.

Problems

Two major problems are encountered in photographing through the stereoscopic microscope. One of these is light; the other is depth of focus. Both become critical problems only at the higher magnifications of about 45X and above. They vary tremendously in their severity depending on the specimen, the background, and other factors.

Both quantity and quality of light have been problems. Given unlimited funds, equipment and technical aid, I am sure that these light problems could be surmounted. Quantity of light is almost always at a minimum when using reflected light at high magnifications and it may often be critical and difficult to surmount. Quality of light, although controllable with proper filtering and regulatory systems, must sometimes be sacrificed for quantity.

The other major problem, lack of depth of focus at high magnifications, is one that is encountered in all photomicrography. However, photographing through the stereoscopic microscope appears to give better depth of focus of small objects than do other available methods. Fig. 3 was made from a Kodachrome transparency taken through the stereoscopic microscope at 90X. The shiny, globose structure is a myxobacterial fruiting body (*Stelangium vitreum*) which measures just under 100μ in diameter. Both the surface of the globe and the periphery are in reason

Figure 3

ably good focus, indicating that a depth of focus of about 50μ has been obtained on this particular photograph. This approximates the greatest depth of focus obtainable at this magnification.

A third, lesser problem is a fuzziness which often comes into being, particularly when using only one ocular, as one approaches 100 diameter magnifications with a stereoscopic microscope. This fuzziness appears to be due in part to the limited depth of focus, in part to approaching empty magnification, and in part to the increased accentuation of stray light. In any event, such fuzziness sometimes presents problems in positioning, lighting and focusing the specimen.

Results

It has been my practice to photograph in color because the entities I have been particularly interested in are very colorful and to have the transparencies backlighted, photographed, and printed in black and white when necessary. The initial results, unfortunately, cannot be shown here in color, but Figs. 4, 5, 6 and 7 have been selected to illustrate the photographs which may be obtained through the stereoscopic microscope. All four of these photographs are prints made from color transparencies.

The white, globose structures in Fig. 4 are fruiting bodies of a myxobacterium (*Myxococcus virescens*) on the rounded surface of a rabbit dung pellet. The pellet measured 8mm x 6mm in size and only a fraction of it is included in this photograph. These fruiting bodies are slightly over 100μ in size, averaging about 115-120μ in diameter. The photograph was taken through an optical system of 45X magnification. Depth of focus is impossible to determine in this case, but it is somewhere in the 100-150μ range at this magnification. Critical focus was made on the one fruiting body in the center of the photograph. Those fruiting bodies toward the bottom of the photograph are pro

Figure 4

Figure 5

gressively more out of focus, as are those disappearing over the edge of the pellet.

Fig. 5 is a photograph, taken at 90X, of a myxobacterial fruiting body (*Chondromyces catenulatus*) on a piece of bark. I know of no other way of photographically recording the appearance of this structure; mounting breaks it into component pieces and flattens it. A glaring lack of depth of focus is apparent. The total height of this structure is 330μ, the stalk portion is 180μ and the mass of cysts at the apex is about 150μ high by 200μ wide. Both the stalk and the periphery of the cyst mass are in focus, but the surface of the cyst mass, some 100μ above the focal plane, is completely out of focus. Some of the individual bead like chains of cysts (each cyst is only 15 x 25μ in size) are quite distinct.

The tiny globes on short stalks in Fig. 6 are myxobacterial fruiting bodies (*Podangium gracilipes*) of less than 50μ in total height. They are on scale-like leaves of a small moss plant and were photographed at 90X. The globose cyst portion of the fruiting bodies is about 30μ in size and the stalk portion is about 15μ. This figure is included to illustrate that very small structures can be photographed.

The final figure, Fig. 7, is a photograph of three fruiting bodies of another myxobacterial species (*Podangium alboracemum*) on a piece of bark. The total structure is about 125μ long and the terminal cyst portion is just under 50μ in diameter. These fruiting bodies were deliquescent and disappeared a few hours later. However, by photographing them through the stereoscopic microscope as they were formed, a permanent record was obtained. Photographs and specimens mounted on microscope slides are the only documentary evidence of this particular organism.

Summation

Photographic records of entities too small to be photographed in conventional manners, except by mounting for the compound microscope, can often be successfully and readily made through one ocular of the stereoscopic microscope with reflected light. Such photography

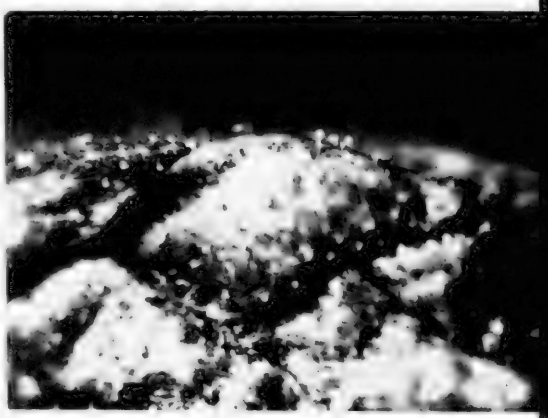


Figure 6

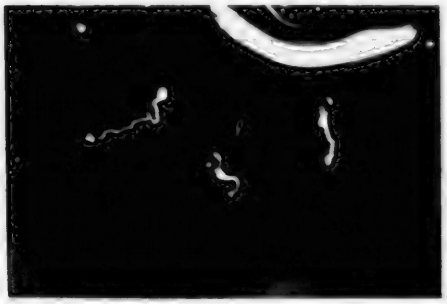


Figure 7

is certainly not original with the writer. The writer makes no pretense at being an authority on the subject, but numerous comments and inquiries to him concerning this type of photography indicate that the procedure has not been previously reviewed in detail. Photography through the stereoscopic microscope has a number of shortcomings and sometimes presents difficulties in lighting, positioning and focusing the specimen. However, the non-technical photographer, using relatively cheap and easily obtainable equipment, can take satisfactory photographs in his own working quarters as the occasion for doing so arises.

SCIENCE plans to start running cover pictures of natural objects photographed either macroscopically or microscopically. This series will begin with the October, 1959 issue. They are seeking such photographs and will pay a fee of $25.00 for any that are acceptable. Please communicate with:

Graham Du Shane
Editor, SCIENCE
1515 Massachusetts Ave., N.W.
Washington 5, D.C.

MEDICAL AND BIOLOGICAL ILLUSTRATION

CONTENTS

APRIL, 1959

Victorian Clinical Photography.

A Technical Close-Up Outfit . . . . . D. L. Cullen

Time-Lapse Film Study of Cell Reaggregation . . E. C. A. Lucey and A. S. G. Curtis

A Method of Vascular Display by Silver Impregnation . . . . P. S. Boulter and A. G. Parks

Plastic Animation in Medical Kinematography . . . . . H. J. Versteeg

Use of Films in Teaching Anatomy in the United States and Canada . . . . . J. E. Markee

Equipment and Methods:

- Johnson Optiscope 1000 MK II Projector.
- New Hand-drawn Letraset Faces.
- New Shading Media.
- Production of Monochrome Prints from Colour Transparencies by the Polaroid-Land One Step Process.

Annual Subscription $10.00

Published Quarterly by the

BRITISH MEDICAL ASSOCIATION

Tavistock Square, London, England

SEND ORDERS TO MEDICAL MARKET RESEARCH LTD., 280 MADISON AVENUE, NEW YORK 16, N.Y.

Journal of the Biological Photographic Association Vol. 27, No. 2 May, 1959

Portable Sound-Proof Booth

FRANK J. REINDL

Chief, Medical Illustration Service,
Veterans Administration West Side Hospital, Chicago, Illinois

LEONARD M. HART

Assistant Chief, Medical Illustration Service,
Veterans Administration West Side Hospital, Chicago, Illinois

Introduction

THE sound-proof booth described herein was fabricated while making several scenes of a medical motion picture at the Veterans Administration West Side Hospital, Chicago, Illinois. At the beginning of this motion picture it was planned to have the narrator's voice dubbed-in after final editing. During the course of shooting, however, the doctor in charge stated that several blackboard scenes had to be incorporated in the movie because of the complex structures which were involved that had to be more fully explained. This immediately presented two problems: (1) the blackboard scenes would have to be shot in a sound-proof room where lip synchronization is possible; (2) the motor noises of the camera and tape recorder had to be eliminated.

The first problem was easily remedied. The Dental Training Center offered the use of their large demonstration room which had an acoustical tile ceiling. By suspending painter's drop-cloths on the four walls (a double thickness drop-cloth along the window wall) and putting several on the floor, we almost had a sound-proof room.

The second problem was the elimination of the motor noises of the camera and tape recorder. A blimp to sound proof the camera (a Cine-Kodak Special II with several PAR conversions: 400 foot magazine, synchronous motor, and a split beam viewfinder) would have cost approximately $1500.00. This was out of the question. Previously, while making master tape recordings for lectures, we used the facilities of the Audiology Department. They have two small, attached sound-proof rooms (6 feet by 8 feet each) with a see-through window between them. These rooms were thought of as a possibility, but were too small to set the stage for shooting. Then came the idea - why not a telephone booth to house our camera and recording equipment? From this came the idea of fabricating a sound-proof booth.

Technique and Fabrication

Plans were drawn for a booth that would be sound-proof, light weight, portable and, we hoped, inexpensive. Figure 1 shows an exploded view of the sound proof booth. The outside walls were made of Celotex and the inside walls were acoustically tiled. The walls were held together (framed) with 2 by 2 inch lumber which provided an airspace between the inner and outer walls.

A 1 foot by 3 feet by 1/4 inch plate glass panel, optically flat and flawless, was installed in the front section (Figure

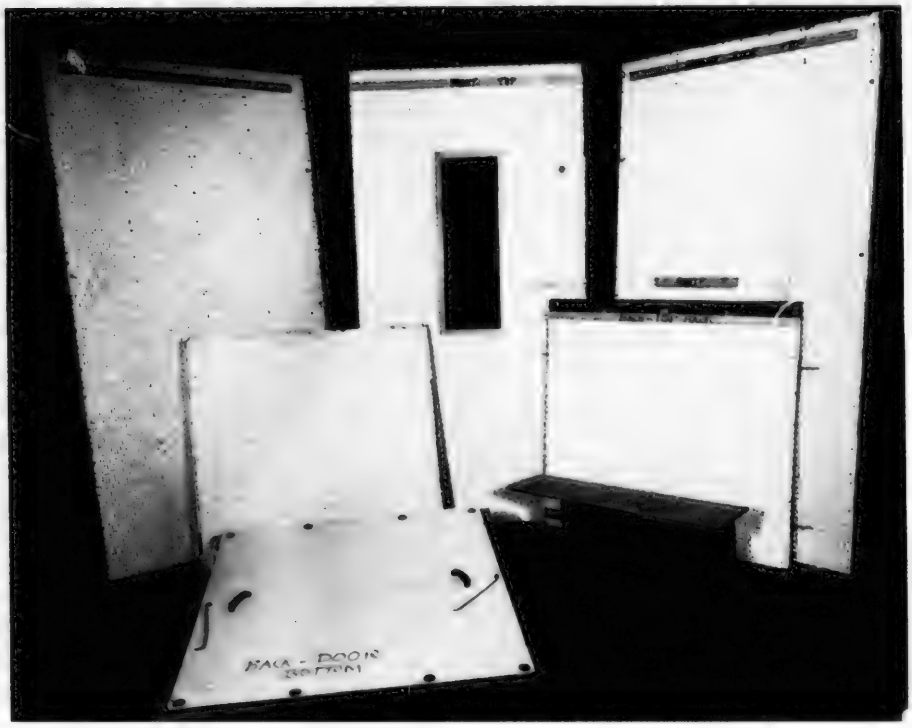


Figure 1
Disassembled sections

2). The height of the bottom edge of the glass is 36 inches from the floor and the width of the glass is centered in the middle of the panel. The front section has protruding bolts from each side so that the side sections can be slipped easily into place. The back side was made in two sections. The top back section has three protruding bolts on each side to hold the two side sections in place. The bottom back section, where access is provided for the equipment and the cameraman, is snapped snugly in place. The top section rests on an indented molding nailed on the four sides. Figure 3, back view, shows the removable double shelf fixed on the inside of the booth to hold the tape recording equipment (Magnasynch X 400), extra film magazines and recording tape. The size of the booth is approximately 4 feet wide, 4 feet deep and 7½ feet high. The weight of each side-panel is 78 pounds, a total of 312 pounds.

The cameraman wears earphones to monitor the voice for the recorder. This also serves as a means of communication from outside the booth, through the microphone. An RCA BK-6B miniature dynamic microphone is used, the same type that news commentators and weathermen use on TV programs.

The inside of the booth has room for a tripod (floating action type) with the movie camera (Cine-Kodak Special II with PAR conversions), a tape recorder (Magnasynch X-400), a three foot alu

Figure 2
Front view

Figure 3
Back view open

minum step ladder, extra 400 foot film magazines and tapes, and a cameraman, with little room to spare. The camera and tape recorder, both having 400 foot reels and are electrically synchronized so that the camera and recorder start and stop simultaneously, providing one man operation.

Fabrication materials and prices are listed below:

Celotex, 4 ft. x 8 ft., 5 sheets	$ 7.50
Acoustical tile, 142 sq. ft.	25.56
Plate glass, 1/4 inch x 1 ft. x 3 ft., optically flat and flawless	10.00
Lumber, 2 in. x 2 in. x 8 ft., 25 lengths	10.50
Incidentals—bolts, nails, molding and shelving lumber	5.00
TOTAL	$58.56
Man hours of labor	32 hours

Conclusions

The sound-proof booth has been used twelve times with excellent results. This technique of using the booth, and synchronizing the camera and tape recorder, made one-man operation possible. The booth can be used to make master tape recordings in addition to movies. The booth is far less expensive to fabricate than the cost of purchasing a blimp for the camera. Besides, with the blimp the tape recorder still would not be sound proofed.

There were two drawbacks to the sound-proof booth. Poor circulation inside the booth was remedied by installing a small fan and limiting the shooting schedule to fifteen minute periods. The booth is not as portable as we planned because of its weight. However, the good features of the sound-proof booth far outweigh the bad.

Journal of the Biological Photographic Association Vol. 27, No. 2 May, 1959

An Intra-Oral Camera Vidicon or 16 mm Movie

W. E. MORRISON

University of Texas Dental Branch,
Houston 25, Texas

THIS camera was designed in order to increase the effectiveness of television instruction of operations within the oral cavity. However, the design is suitable for use with 16 mm movie cameras, requiring only that a prism be located in the optical path. This television camera has been in use at the University of Texas Dental Branch, Houston, Texas since 1956 and has worked quite well

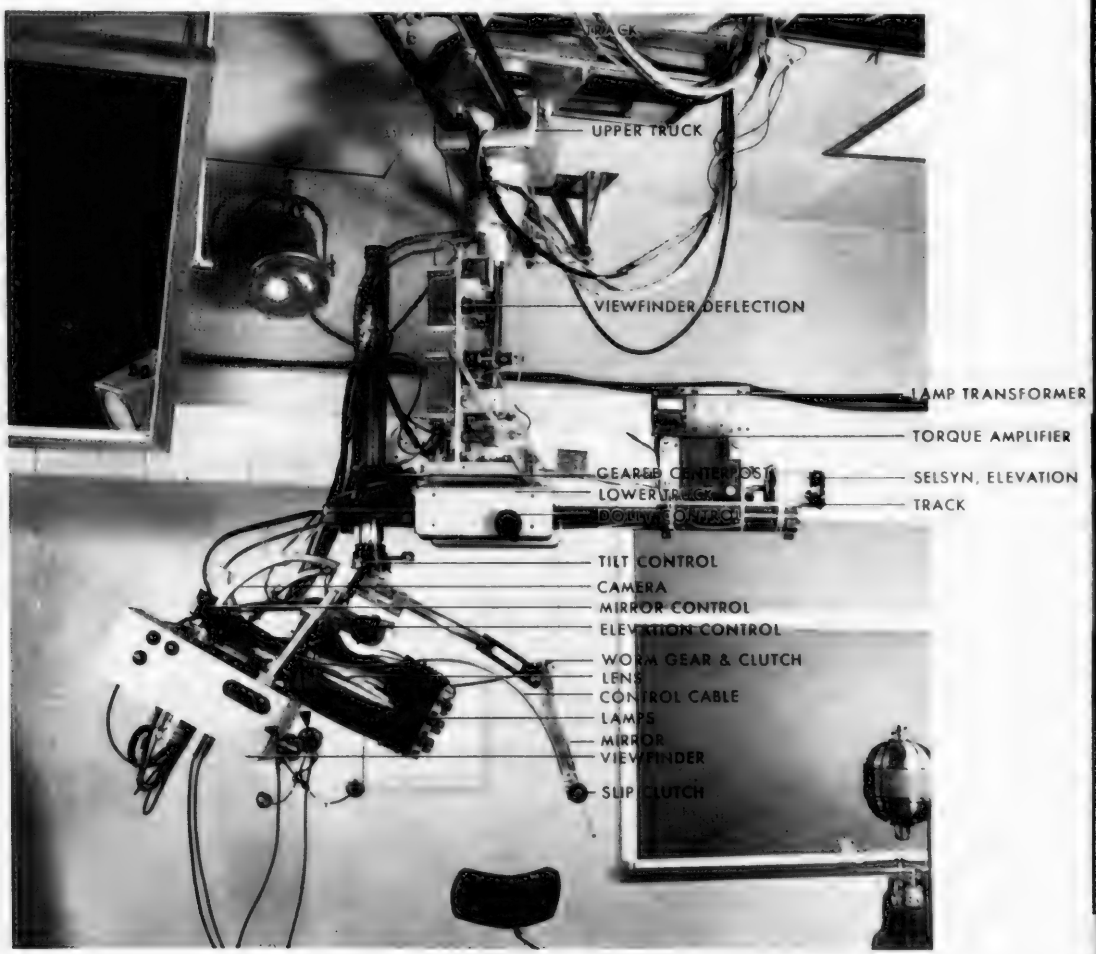
Description

Figure 1 illustrates the method of operation of the camera. The instructor

Figure 1

looks through a semi-transparent mirror into the oral cavity; the camera looks at the mirror into the oral cavity. The latest version of the mirror consists of a 5″ by 7″ tempered twin ground ¼″ glass coated with a Liberty #901, 90% reflectance coating. The upper end is rectangular; the lower end is semi-circular with a 2.5″ radius. The mirror can be rotated through two perpendicular axes. It is coupled through a slip clutch, a 50:1 worm reduction, and flexible cable to the control knobs (Fig. 2)

The lens is a Perkin-Elmer TV-16 Auto Zoom with a focal length of 60 mm to 300 mm. The lens mounting was transferred from the camera to the base in order to facilitate camera interchange. The motorized focus has been changed to manual, and a + 1.5 diopter close-up attachment is used. Co-axial lighting is provided by nine Spencer Universal microscope lamps mounted radially around the lens. Each lamp is equipped with a heat filter. Cross lighting is provided by a Castle Panovision



dental light equipped with a 300 watt T-10 lamp surrounded by a heat filter chimney.

In use, the mirror must be continuously interposed between the patient and the instructor. The camera assembly is mounted to a geared centerpost which is controlled by a servo system. The centerpost is mounted on a horizontal track which rides in the lower truck. Thus the camera assembly can be dollied a maximum distance of ten inches. These two controls, elevation and dolly, determine the vertical angle of approach. The lower truck rotates in a horizontal plane about a vertical axis which intersects the center of the field. This determines the angle of approach in azmuth. The vertical support for the lower truck is attached to the upper truck which rides on a ten foot track parallel to and directly above the long axis of the dental chair. This truck is equipped with a solenoid released brake.

Two cameramen operate the camera. The instructor places the patient in the desired position. Cameraman number one then releases the brake on the upper truck and centers the vertical support on the field of operation. He then rotates, elevates and dollies the camera assembly until the camera axis coincides with the instructor's line of vision. The mirror must also be panned and tilted until the light is centered on the field, then the center must be maintained on the instructor's line of vision throughout the operation.

Cameraman number two makes the necessary minor corrections of the mirror in order to keep the center of interest in the center of the camera field. He also zooms and focuses the lens.

Summary

A television camera has been described which will enable TV viewers to see the same field the dentist sees while operating within the oral cavity. The principle is basic and may be applied to 16 mm movie cameras with either fixed or zoom lenses and a type of coaxial light compatible with the lens used.

In Memoriam

Prof. Joseph B. Homan, 65, pioneer in medical art and for 40 years director of the Department of Medical Art in the University of Cincinnati College of Medicine, died late Tuesday, March 17, at Holmes Hospital where he was taken after a heart attack.

Professor Homan, as usual, worked Tuesday in the department which he established in 1919 at the request of the late Dr. Christian R. Holmes. He and Dr. Holmes had worked together during World War I.

In 1957 Professor Homan received an award from the Biological Photographic Association, naming him a fellow and recognizing his "distinguished craftsmanship and conspicuous contributions to the advancement of photography in the biological sciences." Only a few of these awards are given.

Professor Homan developed the UC medical art department to its present extensive capabilities preparing movies, still photography, slides, drawings, graphs, and exhibits for the UC College of Medicine, as well as for General Hospital and Holmes Hospital, Children's and Christ hospital research foundations and the May Institute at Jewish Hospital.

He was a native of Cincinnati and attended the Cincinnati Art Academy. He is survived by his widow, Mrs. Marjorie L. Homan, 4049 Victory Parkway.

Julian Carlile, passed away in May, 1959. He was a fellow of BPA as well as a Charter Member.

He developed various techniques in plant and animal photography used at the Rockefeller Institute, Princeton, N.J. He was chairman of the New York Chapter of the B.P.A. in 1936 and 1937.

A tireless worker in the promotion of biological photography, he was an important factor in the promotion of our Association also.

Julian wrote several articles published in the Journal of the Biological Photographic Association. He was a member of the Board of Directors from 1944 through 1947.

We have lost not only two good friends, but the field of biological photography has lost two outstanding members.

Photography, A Medium for Education and Research

A course initiated at the University of Illinois, Chicago Professional Colleges in February 1958.

Reported by:
MARIA IKENBERG, FBPA, University of Illinois.
FRANK J. REINDL, Veterans Administration West Side Hospital.
LEONARD M. HART, Veterans Administration West Side Hosiptal.
LOUIS PEDIGO, University of Illinois.

IN the framework of a large institution, almost every day we spend considerable time answering technical questions in the field of medical and general scientific photography. In fact if we are willing to cooperate, we gradually develop a large clientele and get a reputation as an information service. Out of intensive pressure from such a group of interested persons grew the idea to investigate the possibility of a more formal approach to this problem.

With full support from the Vice-President of the University of Illinois, in charge of Professional Colleges, the Personnel Director established at this Campus an In-Service Training Course under the administrative supervision of the Division of University Extension, Urbana, Illinois.

The senior author of this report saw herself confronted with a project which had outgrown personal qualifications and know-how. Full cooperation was found within the Chicago Chapter of BPA. A staff of 12 volunteered their services, with the first and last authors as coordinators.

An outline of the planned course with instructors was submitted to the University, whose administration left us a free hand in whatever we felt should be presented.

A memorandum was sent to all Deans, Directors and Heads of Departments of the Professional Colleges, which include, among others, Medicine and Dentistry, inquiring about interest in such a course within their departments. Our location within a large medical center including the Veterans Administration West Side Hospital, Cook County Hospital, Presbyterian-St. Luke's Hospital and their staff affiliation with the University brought this announcement to the attention of a sizable group.

Forty-seven applications were received within a few days. Seventeen were from employees and thirty from members of the faculty. The latter group consisted of 16 physicians and 14 dentists, representing academic rank from professor and department head to assistant.

These applications gave us information about the extent to which the applicant uses photography in his work, whether color or black and white, with which apparatus he is familiar, etc. If he signed the application he had to answer a question concerning his definite intention to attend classes.

We had committed ourselves to accept a maximum of 18 students in order

to give intensive teaching, especially in laboratory sessions.

The most worthy applicants were selected also considering their sequence of application. The remaining group was informed that their applications were being held on a waiting list for the next course.

Though the course was supported financially by the Personnel Department it was our aim to serve all groups, employees, teaching faculty and resident staff.

The purpose of such a project is not to train medical photographers but is intended to give the participant a better understanding of the utilization of photography in education and research: records of patients, aid in diagnosis, compiling authentic research proof, publication, and other teaching media such as exhibits, etc. However, for those who use photography in their assignments, the course will be of help to improve their technique and results through gaining basic information. We also believe that more knowledge of this essential research tool will contribute to more prudent selection of equipment and thus will often conserve funds.

The course was divided into six two hour periods covering basic photography, and twelve two hour periods which we called applied scientific photography. It was given once a week from 6 to 8 P.M. and thus covered 18 weeks. Lectures, demonstration sessions, laboratroy periods with student participation were included. This is the complete outline:

Lecture I	General introduction Introduction of Photography Short history of photography
	Cameras -- Miniature, standard, professional
Lecture II	Lighting Optics Sensitometry
Lecture III	Lab session: Demonstration — Optics, Lighting, Exposure calculation
Lecture IV	Chemistry Emulsions - - Processing
Lecture V	Lab session Demonstration and discussion: black and white color
Lecture VI	Projection: Room, devices and their maintenance

Applied Scientific Photography

Lecture VII	Equipment - - specific still motion picture
Lecture VIII	Physics of light Illuminators Filters Meters
Lecture IX	Studio Session Photographing subjects
Lecture X	Studio Session Photographing objects
Lecture XI	Studio Session Copying
Lecture XII	Lab Session Printing
Lecture XIII	Photomacrography Photomicrography The microscope Basic principles
Lecture XIV	Photomicrography Ultraviolet, Phase, etc. Cine - timelapse

Lecture XV	Lab Session Photomicrography
Lecture XVI	Special applications Equipment, etc. Fundus, Endoscopic, Stereo Ultraviolet, Infra-red, etc.
Lecture XVII	Motion Picture Production Principles in educational films. producing and editing silent, sound
Lecture XVIII	Psychology of audio visual education Effective use of the medium

It should be mentioned that in laboratory sessions the class was divided into at least two groups and the instructors would repeat their subjects during the two hour period, thus giving more individual attention to each student.

An excellent series of Navy films on basic photography was used, together with numerous other teaching aids. We would like to mention the valuable cooperation we received from representatives of scientific instrument manufacturers.

Since we consider it our function to contribute to better teaching, we devoted one period to audio-visual media, the classroom itself and its equipment, including maintenance. At the last session we had an invited speaker, an audio-visual specialist from the University downstate campus who covered Psychology of audio-visual education and the effective use of the medium. The conclusion that evening was a social one at which time the Extension Division gave certificates to those who showed the required attendance record.

Before ending the course, questionnaires were distributed which were designed to elicit a critical appraisal of subject matter and teaching. We found that our general outline was satisfactory: basic photography was considered a necessary requirement by 16 of the 18. A number wanted the course tailored more to their specific needs and many asked for more laboratory sessions. The general request was for more photomicrography, even though we had already allotted more time to this subject than any other one. There is no doubt in our minds that our teaching will have to be improved as we go along in order to make this an effective curriculum.

In conclusion we have to say that the comments which we received and which were given to the University were extremely favorable. The Extension Division is prepared to repeat this course and add it to its permanent curriculum. In order to comply with more requests and to improve in various directions, application has been made for a grant to subsidize our effort. It is our intention to make the course available to more students in which case we have to have more instructors in laboratory sessions. We like to prepare outlines, and transcriptions of some periods, which will enhance our own improvement and be of advantage to the student. If we receive such a subsidy we can accept students who have no affiliation with the University of Illinois and will be able to follow up the main instruction series with shorter courses to small groups. The Extension Division's ruling requires, otherwise, a minimal number of 15 participants.

The results and satisfaction which we have derived from this project lead us to encourage other Chapters to contribute towards better communication in medical and allied sciences.

NEW MEMBERS SINCE 10-15-58

ALABAMA	
Gadsden	Sister Marie Consuelo, (Oates), Holy Name of Jesus Hosp.
CALIFORNIA	
Encino	Loren G. Lipson, 4915 Libbit Ave.
Glendale	John F. Kelly, 416 S. Central Ave.
Riverside	George J. Anday (M.D.), 6727 Clifford St.
San Francisco	Dr. Horace B. Remy, 5833 California St.
So. San Francisco	Mrs. Cecile D. Kinney, 356 Granada Drive.
CONNECTICUT	
Hartford	Melvin Alberts, 74 Pershing St.
New Britain	Bruce Stuart, 64 8th St.
FLORIDA	
Orlando	Russell M. Smith, P.O. Box 3282
ILLINOIS	
Chicago 40	Fred Hartman, 6251 Sheridan Rd
Chicago	Jim Reed, A.M.A., 535 No. Dearborn St.
IOWA	
Iowa City	E. Lee Allan, Univ. of Hospitals, Dept. Opth.
Waterloo	Harry A. Hollett, 4025 Falls Ave.
MARYLAND	
Riderwood 4	Rowland B. Schnick, 7911 Sherwood Ave.
Hyattsville	Thomas R. Turner, 9307 19th Ave., (Apt. 2)
NEBRASKA	
Fairbury	J. Harold Lynch, M.D., 725 5th Ave.
NEW JERSEY	
Montclair	William D. Young, Jr., 68 Gates Ave.
E. Rutherford	Samuel Sanders, 83 Uhland St. (Sander's Lab. Inc.)
New Brunswick	John B. Sanders, Jr., Colgate-Palmolive Co., Biol. Labs., Easton Ave
New Brunswick	Nicholas M. Gorog, M.D., Logan Lane
NEW YORK	
New York 71	Fred Orkin, 4643 Waldo Ave
New York 28	Phillip Strax (M.D.), 1056 5th Ave
New York	Betty Jean Skrefstad, Med. News, 131 E. 59th St
Westbury, L.I.	Robert S. Millen (M.D.), Box 248
New York, A.P.O. 254	SP-4, V. C. Bunner, RA 12 470 357, Tuslog Det No. 4
Bronx	Joseph Merino, 2420 Morris Ave
Bronx 62	Hyman Gold, 2155 Bolton St
NORTH DAKOTA	
Fargo	Mrs. Janet Levy, Dept. Botany, N. D. Agri. Coll. State Coll. Station
OHIO	
Cleveland	W. M. Holmes, St. Lukes Hosp., 11311 Shaker Blvd
Toledo	Dr. M. W. Shapiro, 1054-59 Spitzer Bldg.
OKLAHOMA	
Tulsa	Dr. Leo Lowbeer, 1635 E. 12th St., Hillcrest Med. Center
SOUTH CAROLINA	
Charleston 16	Mrs. Shirley J. Whaley, 16 Lucas St., Med. Coll. of S.C.
UTAH	
Salt Lake City	Michael O'Flynn, 1326 W. North Temple
Salt Lake City 8	Philip O. Bryer, 2170 Blaine Ave
VIRGINIA	
Norfolk 7	Dr. Lewis Littlepage, Jr., 941 Baldwin Ave
WISCONSIN	
West Allis 19	Thomas C. Uithoven, 7318 W. Beloit Rd
WASHINGTON, D.C.	Wilber C. Lown, 301 33rd St., S.E. Sally Louise Craig, 1206 Hemlock St., N.W.
SWEDEN	
Halsingborg, Raa	Miss Sune Berkeman, Tullgatan 2
CANADA	
Montreal, Que	C. Anthony Graham, Dept. Anatomy, McGill Univ.

A Method for Duplicating Lantern Slides

ROBERT F. ALBRIGHT
Indianapolis General Hospital, Indianapolis, Indiana.

FOR some time the Indiana State Medical Association has been making tape recordings of papers presented by the speakers at various medical meetings. These tape recordings were duplicated and kept in a central library for use by small local medical societies who could not afford the benefits of "name" speakers. Many speakers, however, use and discuss a great number of slides during the course of their talks and this created the problem of being able to reproduce the slides to accompany the tape recordings. Since it was usually impossible to borrow the slides long enough to have them duplicated commercially, the following was devised to obtain copies of the slides with a minimum of time and inconvenience to the speaker.

A small view box was constructed in a portable carrying case (Fig. 1 & 2). At one end of the view box an upright arm was installed as a camera support. This arm was slotted for movement of the camera to obtain 1:1 copies of 2x2 slides at the lower position and reductions of 3¼x4 slides at the upper position (Fig. 3 & 4). While this particular unit was designed for use with a Leica camera and bellows focusing device, it can be adapted easily for use with any camera using extension tubes. The entire unit was constructed of wood but great care was taken in the selection of a hard wood for the camera support so that it would not warp. (A later model of the box will have the camera support constructed of aluminum). Storage space is provided behind the camera support for the camera, extension tubes, extra film, etc. (Fig. 5). Dimensions of the box are as follows:

Overall 10" wide x 12" long x 16" high

Storage space 4" wide x 8½" long x 12" high

Surface area of view box 5" x 7"

Figure 1

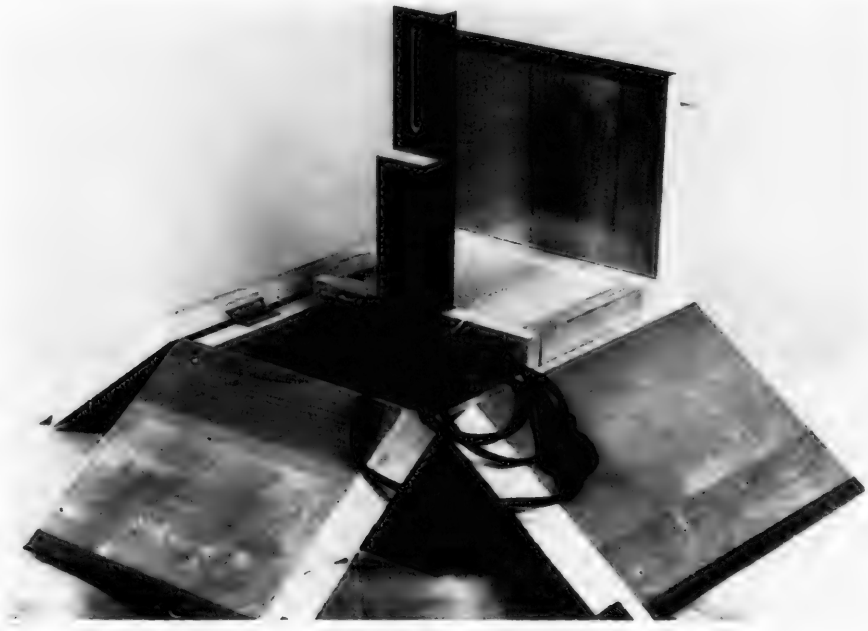


Figure 2

The lid, which has a handle for carrying, is secured by four clamp type fasteners. Three of the sides fold down for ease in operating and the fourth side (opposite camera) serves to shield against stray light. This side also offers more positive support to the box during transportation.

Fluorescent lighting was chosen because of the excessive heat involved with other light sources during extended use. Four 4 watt 6 inch cool white fluorescent tubes provide the light and are controlled by the switch at the left of the camera support (Fig. 5 & 6). Cool white fluorescent tubes were chosen because they required less color correction than other types of fluorescent tubes.

Individual masks for either 2x2 or 3¼x4 slides fit on the surface of the ground glass and enable the operator to duplicate a series of slides without having to check the positioning of each slide. The masks are made of plastic and are centered by means of guide pins on the frame which supports the ground glass. Color correction is obtained by the use of a Harrison & Harrison C-4 filter. The basic exposure for 2x2 slides is ½ second at F4.5 and for 3¼x4 slides is 1/5 second at F4.5 using Type F Ektachrome film.

Summary

The duplicating device described above makes it possible to reproduce any size lantern slides accurately and quickly. By following the instructions and basic exposure printed on one of the folding sides of the box, the person making the tape recordings can also duplicate the slides. This master set of duplicates can

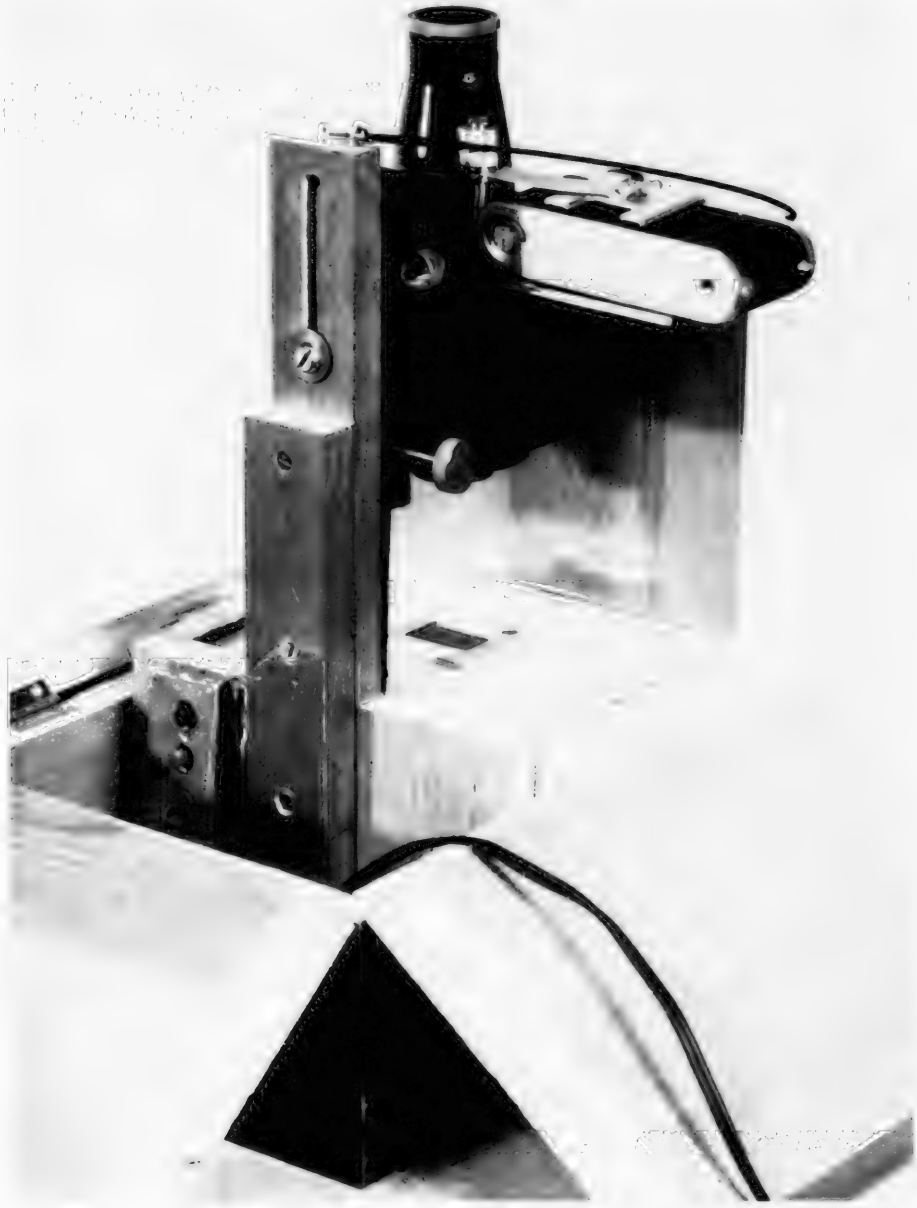


Figure 3

then be used to make other sets or film strips. Slides can be duplicated in this manner much faster and with less expense than with commercial duplication and at much less inconvenience to the speaker.

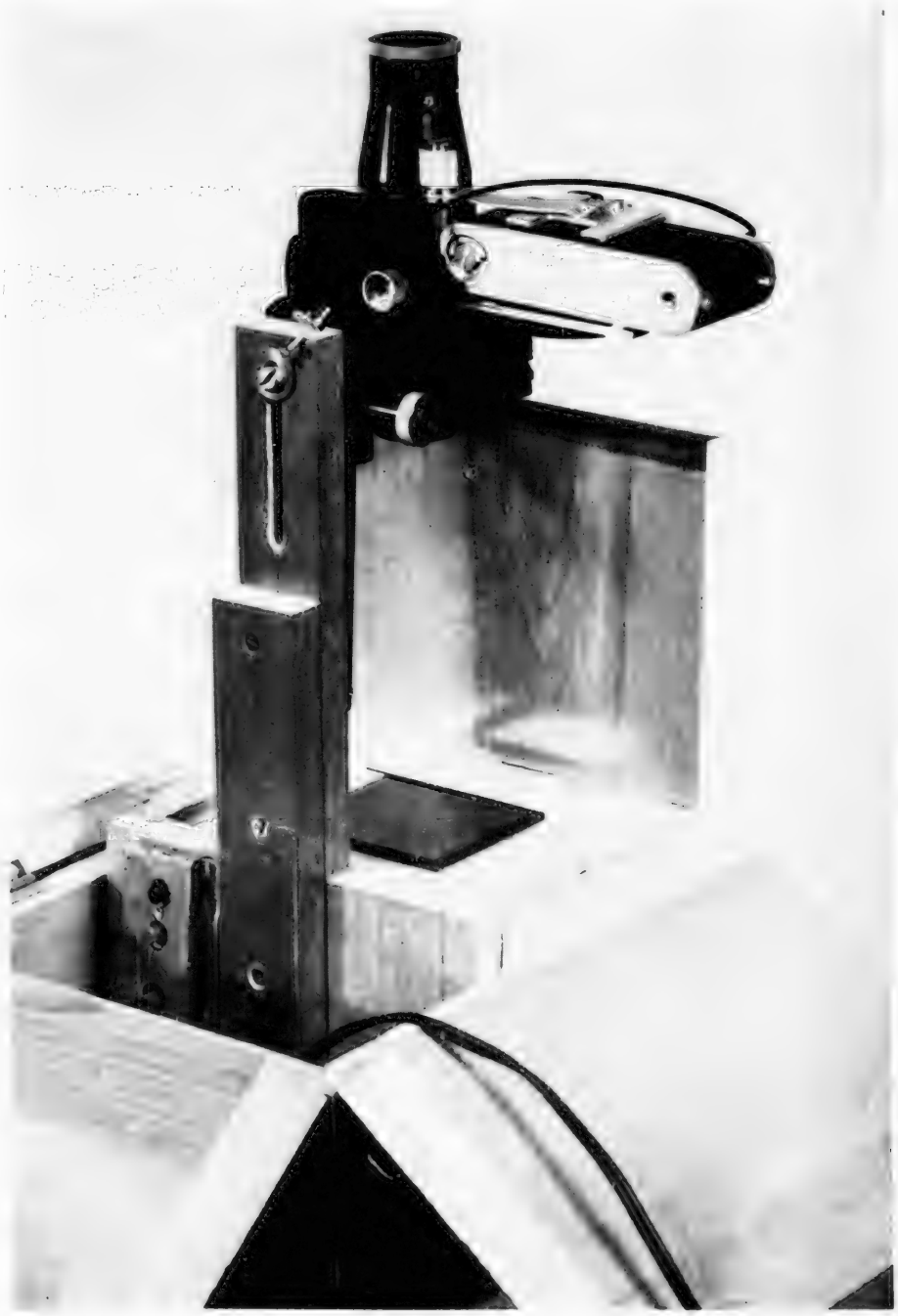


Figure 4

Figure 5

Figure 6

A Budget-Minded Method of Producing 2x2 Black-and-White Projection Slides

C. P. TAYLOR

Director of Visual Education, Baltimore College of Dental Surgery, Dental School, University of Maryland, Baltimore, Maryland.

FACED with an exceedingly large order for black-and-white slides, a convenient and inexpensive production method had to be devised. In the past, Kodak Lantern Slide Plates were used, but the cost of this material plus the processing time factor would have been a great disadvantage.

Perhaps the passing on of a solution to this problem will benefit others who may experience a similar situation.

An old 35mm camera, in this case a pre-war Kodak Retina, was obtained from a photo dealer's junk box. Any other 35mm box would have sufficed, but the fact that the front of the Retina closed light-tight was an advantage. The lens, shutter, and bellows were removed and discarded. The camera was then mounted on a specially but easily constructed bed (Fig. 1).

The sliding panel and side rails were constructed with a tongue and groove arrangement so that the apparatus would not fall apart when moved about. All parts were glued and screwed together to maintain stability. Rubber feet were fastened to the underside to prevent slipping. The camera was mounted on the riser with three screws through the camera back (Fig. 2).

After mounting the camera the distance from the riser to the film pressure plate was accurately measured and found to be 3 mm.

A focusing panel was then constructed using heavy fiber material the thickness of which was exactly 3 mm and an outside dimension of 2x2 inches. A field measuring 1x1½ inches was inked in the center of the focusing panel (Fig. 3).

By moving the sliding panel assembly forward against the end rails, the apparatus was placed on the enlarger easel with the camera in the forward position. The enlarger was adjusted for image size and focused on a piece of scrap film placed in the camera in the normal position. Sliding the camera back to the rear position, the focusing panel was oriented and cemented in place.

Figure 4 shows the completed printer being used. The adjustment screw built into the original model was found to be unessential since the camera and focusing panel were securely fastened.

Two types of readily available film are used. Fine Grain Pan supplied in 100′ rolls covers most requirements. For extremely high contrast, Micro-File film is used, this product also is supplied in 100′ rolls. The cost of the film is approximately 15% of that of the plates, quite a saving for the limited budget department. Printing and processing time is also reduced considerably even though the film has to be loaded into 35 mm cartridges. These, too, were obtained free of charge from a local photo-finisher.

Operation is very simple. When the

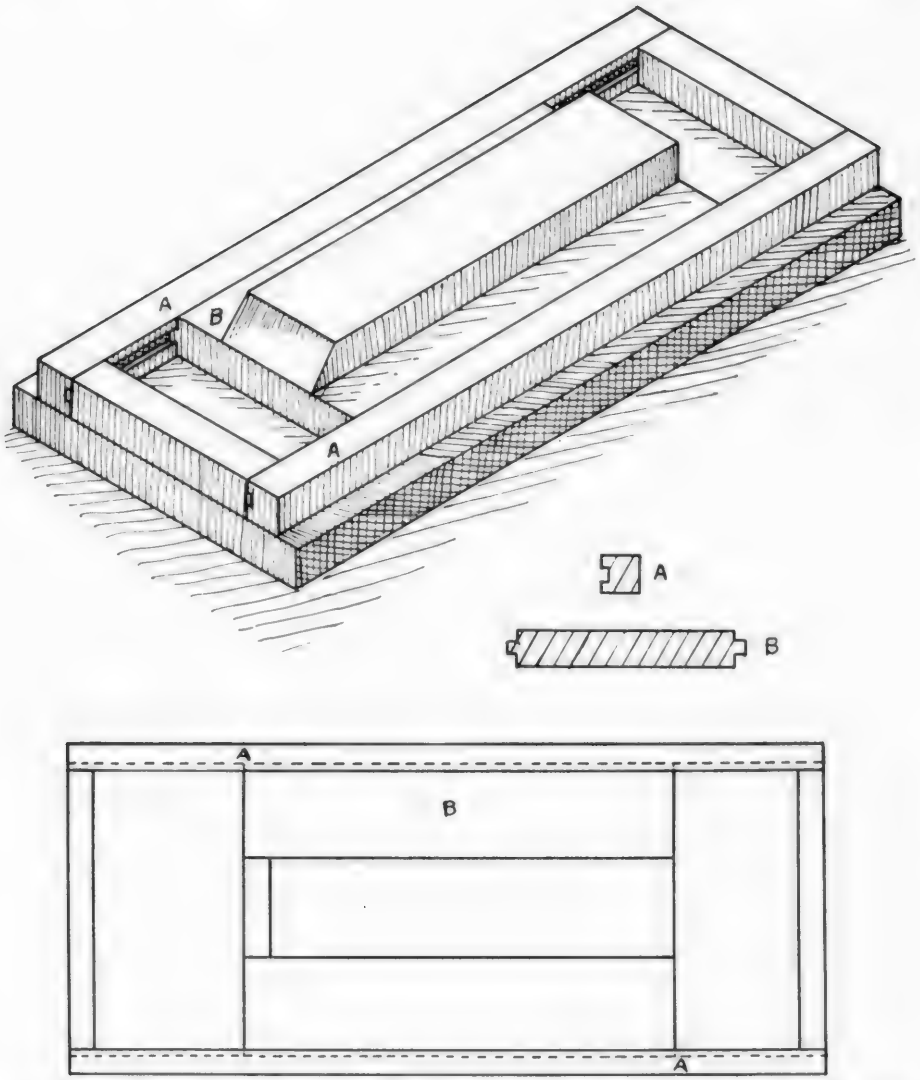


Figure 1. Base, rails, sliding panel, and riser were constructed with three-quarter inch stock. Pine or plywood does an excellent job. Dimensions have been omitted due to the fact that all cameras would not fit any one particular dimension. Tongue and groove construction of the sliding panel and the side rails was done as a safety precaution but can be dispensed with if desired.

camera is positioned to the rear, the enlarger is adjusted for image size and focused on the white field of the focusing panel. The film is wound into place with the automatic counter and stop of the camera. The sliding assembly is then pushed forward bringing the camera directly under the lens of the enlarger,

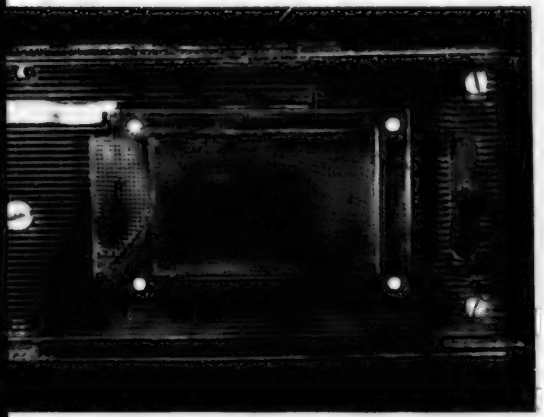


Figure 2. The camera is fastened to the riser with three screws through the camera back. Small flat head screws must be used taki·g care that they do not project so as to prevent closing the back.

thus receiving the same image focused on the focusing panel. The exposure is made in the usual manner and the film advanced to the next frame. The proc

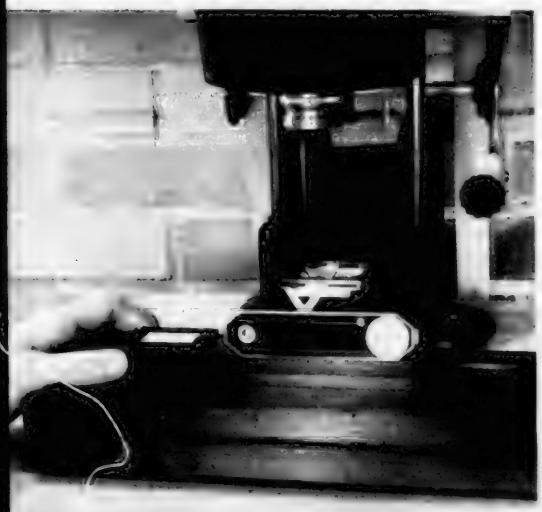


Figure 3. A field, 1x1½ inches should be inked on the focusing panel. Blacken the borders leaving a white center on which to focus.

ess is repeated again and again following the same pattern until the end of the film is reached and/or the order completed.

Fine Grain Pan film can be given after-treatment in the same manner as the lantern slide plates. It can be given the Farmer's Reducer treatment, toned, or stained for various effects. Mounting

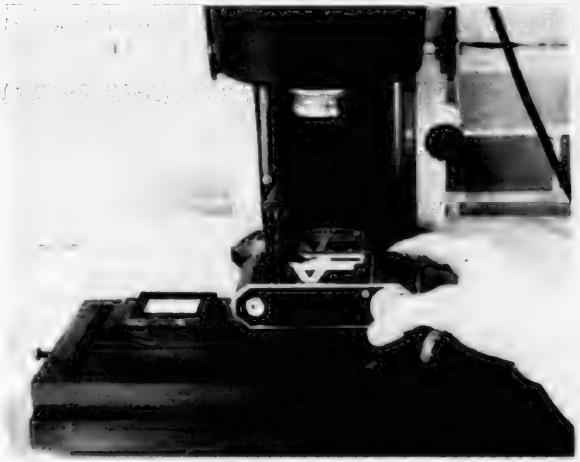


Figure 4. The assembly in use.

is handled in the same manner as 35 mm color slides, with paper or glass and metal mounts.

This set-up has proved to be very useful, and the savings in time and money have been extremely gratifying. Quality-wise the results are equal to those obtained by the older method.

Acknowledgements

The author wishes to express gratitude to Mr. G. P. H. Foley for his assistance in checking this manuscript. Appreciation also to Mr. W. J. Sachs and Mr. P. F. Szcepanski for the illustrations. All three are on the staff of The Baltimore College of Dental Surgery, Dental School, University of Maryland

28 TH ANNUAL MEETING
AUGUST 18-21, 1958
WASHINGTON, D.C.
Photos
Pierre LeDoux

Association News

A section of the Journal devoted to official announcements, chapter events, and other matters of historical significance to the Association.

It has come to our attention that Verlin Y. Yamamoto, our Vice-President and Barbara Allison, Veterans Administration Medical Illustration Service, Des Moines, Iowa, were awarded a Special Certificate in San Francisco. The award was presented to them for the "Best Medical Illustration" in connection with the exhibit, "Upper Dorsal Sympathectomy." Congratulations Verlin and Barbara. We know that this honor was well deserved.

General News

The first Annual Midwestern Sectional Meeting was held in Iowa City, April 24-26, 1959. Charles Deutch was General Chairman and four chapters were sponsors: Upper Midwest, Prairie, Chicago and Wisconsin. Seventy-five members attended. The program included a presentation of motion picture films submitted by members, an introduction of the four chapter presidents, a series of scientific lectures, luncheon with Henry Morris of the University of Minnesota as guest speaker, banquet with Dr. Bunge of the University of Iowa as guest speaker, a stereo presentation, a panel discussion on the use of color negative material in biological photography, and a business meeting. The Spring Board Meeting of the National BPA was held in conjunction with this sectional meeting. At the Board Meeting the new Southeastern Chapter was granted a charter (this makes 21). Also at the Board Meeting Mr. Carroll Weiss was appointed Director of Communications for BPA. Mr. Weiss is with the Clinical Research Division of Schering Corporation and is reactivating an organized plan of professional and press publicity.

The 1959 Annual Meeting will be held in Montreal, Canada, August 31 to September 3. The social highlights will include a get acquainted party sponsored by Ansco of Canada, a President's Reception, official luncheon, Awards Banquet, tour of the City of Montreal and trip to the Laurentians. So — in case you aren't interested in biological photography — come anyway — it's bound to be fun.

Reminder: All chapter officers *must* be members of the National BPA. Please be sure to check this when a nomination is made for a local office.

The Chapters Committee will meet as usual at the Annual Meeting in Montreal. The time and room will be announced and posted at the hotel headquarters. We are looking forward to seeing a representative from every chapter and hope they will come armed with questions, suggestions and what have you. Our National Secretary is most anxious to have a list of the members of each chapter with addresses and designation as to whether a member is National or Local. Please send the list to L. B. Brown 188 Longwood Ave., Boston 15, Mass. We thank the two chapters who complied after the first request — Southern California and Prairie.

CHAPTERS

Boston: In May the Dephoure Studios were host to Boston Chapter members. Dephoure is a producer of medical, commercial and TV motion picture films. The June meeting, the last of the season, was held at Harvard School of Dental Medicine. A local salon was held and a prize was given by the Eastman Kodak Stores to the winner. Much to his embarrassment this was won by Chapter Chairman Larry Brown. The best local entries were selected to be sent to the National Salon in Montreal. The rest of the evening was used for a symposium on time-lapse photography. George Wiggins discussed the design of the apparatus; Wolfgang Zieler the adaptation and application of available commercial equipment; and Dr. Paul Goldhaber

demonstrated some of his specific problems in this field.

Northern California: The April meeting was held at the Stecher-Traung Lithographic Corporation in San Francisco. Mr. Norman Powers conducted a tour and explained the lithographic printing process. In May, at San Francisco State College, Orville Goldner spoke on "Modern Trends in Aids to Audio Visualization as Related to Communication". Mr. Goldner has designed and built many exhibits around the world. He is presently working on education by TV. In June there was a group discussion workshop on Edwin Land's new theory of color vision. The two projector experiment described in the Scientific American was demonstrated.

Southern California: April meeting was held at Cedars of Lebanon Hospital. There was a print judging of the exhibits from National BPA and from So. Cal. members. It was decided to have a workshop once a month aside from the regular meeting. A questionnaire was sent to members to determine what subjects would be most popular. The first one will be a combination field trip and workshop at Technifax. In May the Los Angeles Time-Mirror was host to the group. Hubert McClain, staff photographer, conducted a tour and discussed all the steps from selection of a subject to the finished presentation. The June meeting was a welcome back to Edwin Lundy. Since September 1958 he has traveled 60,000 miles, took 55,000 feet of movie film and 4,000 slides. He gave a talk entitled "Photographic Problems and End Results of a World Wide Journey".

Chicago: Seven members attended the Midwestern Sectional Meeting and two gave papers. In April there was an election of officers: President Leonard Hart, Vice-President Jack DeBrum, Secretary Evelyn Palmer, Treasurer Charles Lindsay. Norman Salmon of EK was the speaker at the May meeting. His subject was "Techniques for Visual Aids Reproduction". He showed examples of visual techniques in B&W and color. Six members of the Milwaukee group attended this meeting. The June meeting was a picnic and tour of the laboratory at Argonne National Labs. There was a door prize donated by Standard Photo Supply of Chicago. There will be no more meetings until September.

Intermountain: April meeting was held at the University of Utah. Two topics were discussed: "New Developments in Emulsion Films" and "Diazo Process" by Paul Heath of Sperry Utah Engineering. In May there was a workshop on "The Use of Strobe (Electronic) Flash in General and Biological Photography". Ted Collins and Robert Goodin were the discussors. Demonstrations were made with Polaroid Film. It was voted to organize a salon of prints, slides and motion picture film for next September which will be the next meeting date.

New York: In April Detective O'Hara gave a candid exposition on the ways in which photography is used in the detection of criminals. The May meeting was the last of the season and election of officers was held: results not yet received except that Mary Mason is still secretary and her new address is: 55 West 8th Street, New York 11, N. Y.

Pacific Northwest: Since the report of the February meeting arrived too late for Bulletin 10 where it rightly belonged we will give a brief resume here. There was a full day's meeting with a discussion of "Basic Color Consideration in Color Photography"; an exhibit; a tour of Seattle; and a business meeting with election of officers for 1960. The officers elect are: Chairman Kenneth Buckley; Vice-Chairman Ada Cambern; Secretary Kay Hoskin; Treasurer Roy Hayashi. A meeting was scheduled for May 1959 in Portland.

Prairie: The April meeting was devoted to preparing an exhibit in Veterinary Medicine. In June the group went on a field trip to Zercher Photo, Inc. in Topeka, Kansas. There was a discussion of photographic color printing and transparencies.

Southeastern: Welcome to our newest chapter. Officers are: Chairman: Robert A. Brown of Charleston, S. C.; Vice-Chairman: William B. Manual of Emory University in Atlanta, Georgia; Secretary-Treasurer: Ethel McMinn of Charleston. There was a meeting in June at Emory University. It was decided to have a local salon and a committee was appointed. The fall meeting was set for November in Charleston, S. C. On June 15 there was a clinic on Ektacolor at the E. K. Co. in Chamblee. Twelve members of the chapter attended.

St. Lawrence Valley: At the April meeting the group was addressed by M. Marcel Cailloux, Associate Professor of Biology at the U. of Montreal. His talk was entitled "From Lumicolour to Dufay Colour to Super-Anschochrome". He discussed some of the problems and tricks learned during twenty years of experience in the photography of plants and flowers. At the Neurologic Institute in Montreal in May, Tony Graham described a method of making direct B & W prints from color transparencies (positives) by reversal processing of the paper on which they are printed. Also in May there was a visit to several of the scientific departments of the Institute of Experimental Medicine and Surgery with Mr. Nielson, Chief Photographer. No notice of a June meeting — and we are sure this means that all effort is being directed toward a successful 29th Annual Meeting.

Western N.Y.: The chapter constitution has not yet been amended to officially change the name from Rochester but this will be done as soon as possible. The third meeting of the current season was held at Rochester General Hospital. John Bostrup of E.K. discussed the new Ektachrome E-3. H. Lou Gibson showed some of the travelling salon and read from his original manuscript used in making a tape which will be available to chapters. There was a business meeting with election of officers for 1959-60: Chairman Marjorie Jacobson, Vice-Chairman Melford Diedrick, Secretary-Treasurer T. Llyle Keith.

Wisconsin: The April meeting was held at the Eugene Wald Laboratories in Milwaukee. Jack Emslie of E.K. spoke on the new Ektachrome Type 3 film.

SEE YOU ALL IN MONTREAL

I. B. Brown, *Chairman*
Chapters Committee

New Products

KODAK PUBLISHES EXTENSIVE NEW DATA ON RADIATION MONITORING

Extensive new information on the characteristics and usage of Kodak films employed to monitor radiation in the fields of atomic industry, science and medicine has been published by Eastman Kodak Company.

A new twenty-page booklet, "Radiation Monitoring with Kodak Personal Monitoring Films," outlines information on the four types of Kodak film used for these purposes and includes more data on calibration and processing considerations than has been available in the past.

The films described are designed primarily to be worn by individuals in monitoring badges. Kodak Personal Monitoring Film — Types 1 and 2 — measure x-, gamma- and beta-radiations, while Types A and B are neutron-sensitive films.

The publication outlines the photographic method of obtaining accurate and permanent [illegible] by individuals and by specific areas.

Illustrated with line drawings and graphs, "Radiation Monitoring with Kodak Personal Monitoring Films" also includes an extensive bibliography of technical literature. A copy of the booklet (P-31) may be obtained without charge from Eastman Kodak Company, [illegible]

THE NEW WATSON SWEEP SECOND TIMER WITH INSTANT RESET

[illegible] the lever on the left and has a regular [illegible]

For years we have been trying to develop [illegible] push the lever down and both sweep second [illegible]

The dial face is white with black arabic numbers and black minute [illegible] reading.

[illegible] Dark-room, Radio use. You can time anything with it. It is especially versatile because it can be started and stopped with the timeout lever or for quick readings can be snapped back instantly with the flyback

lever. This allows for repeat timing of short printing runs in the darkroom just by snapping down the flyback lever once for stopping reading and starting again.

The sturdiest, most accurate and versatile stopclock on the market. Price is $21.00.

[illegible] by E. H. Scheu, Inc., 333 South Wabash Avenue, Chicago 4, Illinois.

MOTION STUDIES IN COLOR BY ERNST HAAS CURRENT EXHIBITION AT GEORGE EASTMAN HOUSE OF PHOTOGRAPHY

[illegible] work of Magnum [illegible] are currently being exhibited at the George [illegible]

Mr. Haas joined Magnum in [illegible] Much of his work in this area has been published and exhibited widely and it includes [illegible] Africa, Venice and bullfighting. Through the [illegible]

ca, seven large transparencies of some of his most striking motion studies have been installed in the Eastman House of Color [illegible]. Tear sheets of a number of color essays by Haas, published in LIFE magazine have also been placed on display to indicate the editorial application of his work by one of the nation's leading magazines; of his work LIFE states, "As a craftsman who believes that photography owes an obligation to art, Ernst Haas has long been troubled by the thought that the eye sees with something less and something more than the [illegible]. To [illegible] and nature move and are seen not as fixed images but blending, blurring and flowing intensifying color or rendering it transparent distilling the essence of his belief that 'reality is not fixed in time.' Seeking to transcend the modern camera's perfection in capturing arrested motion, Haas, . . . set out to explore what he calls a fourth dimension of time [illegible]."

The exhibition will remain on view at the George Eastman House through the months [illegible].

NEW B & L READER PROVIDES ADDED USER COMFORT

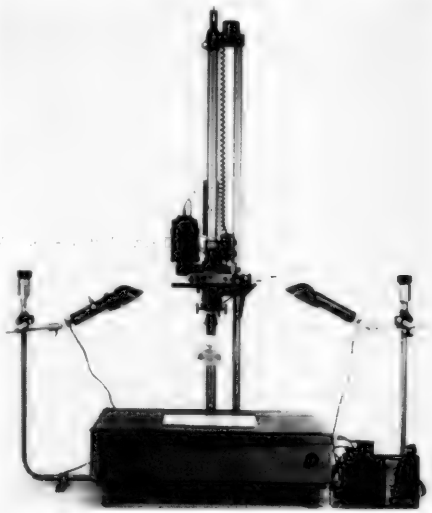
Bausch & Lomb Optical Co., Rochester, N.Y., [illegible] popular rectangular reader. A redesigned,

fluted handle provides easier gripping, more comfortable handling.

The B & L reader frame and handle is made of light weight molded plastic and is available in three colors: ivory, demi-blonde, and ebony. Price $4.50.

LEITZ NEW ALL-PURPOSE UNIVERSAL MEDICAL CAMERA UNIT

E. Leitz, Inc., New York, N.Y. announces the availability of a new all-purpose "UNIVERSAL MEDICAL CAMERA UNIT [illegible]" photography. This versatile precision instru-



[illegible] to all phases of medical and scientific [illegible]

[illegible] tography, Extreme Close-up Work, Macro Photography, Duplicate Copying of 35mm Color Slides, Reduction of Color Transparencies, Photomacrography under Transmitted Light [illegible]

[illegible] tum exposure guide is furnished with the Power pack is fed by A.C. current; no need [illegible] into shooting position. Photography [illegible]

nident light is done with two electronic flash heads on universal brackets which can be turned into any direction. Unit is supplied with illuminated blue glass background, which may be interchanged with other glass sheets of different color if desired. Extension tube unit extends from infinity to a 1x1 image with [illegible] Apotar and focusing bellows arrangement. Other macro lenses are available for the unit to bring work up to the range of the microscope. With adapter RPNOO (available at extra cost) the unit serves as a 35mm photomicrographic camera. Copying masks in all standard photographic film and X-ray film sizes are furnished with unit. Electronic flash system can be used at full or half intensity. Automatic diaphragm presets lens aperture. Focusing projection head with 100 Watt lamp serves for quick copying work. Unit features built-on tape measure in inches and centimeters. With the Leitz Macro Dia Housing (available at extra cost) transmitted light photomacrography work can be done. System provides for both ground [illegible] transmitted illumination.

Unit price [illegible] without Leica camera body. All Leica camera models can be used. This instrument is available through all franchised Leitz scientific instrument dealers [illegible] write to E. Leitz, Inc., 468 Fourth Avenue, New York 16, N.Y.

NEW AGFA SUPER SILETTE LK 35mm CAMERA

Agfa Incorporated proudly presents the completely new Agfa Super Silette LK 35mm camera.

Happy [illegible] here for the photographer who wants true automation in a precision yet inexpensive miniature.

The Super Silette LK is extremely well engineered for foolproof operation even in the hands of a 'first' time user.

A salient feature in the new Agfa Silette LK is the automatic coupling of the super sensitive exposure meter to the versatile Pronto LK shutter – with shutter speeds of 1/25th [illegible]

A big plus to this feature is a "RED FLAG" safety device built into the exposure meter which "tells the photographer" when lighting conditions are inadequate for the making of [illegible] exposures. Another outstanding engineering plus is the combined single window brite-line view-range finder making it simple to view, focus and correct for parralax simultaneously. The world famous Agfa Color Apotar F2.8 - 45mm lens assures needle sharp pictures in both black and white or color.

The Agfa Super Silette LK will be displayed [illegible] A full line of accessories are available.

Camera $89.95. Leather Carry Case $[illegible] (made in West Germany

WORLD'S FIRST "CAMERA CRADLE" PUT ON MARKET BY CHICAGO FIRM

A new Camera accessory which it is claimed, "makes 35mm camera work as modern and as simple as push-button driving," has recently been perfected by a Chicago Firm, AUTOMATIC TRIPOD, INC., located at 2337 South Michigan Avenue.

The new camera device now being put on the market is precisely engineered, [illegible]

built, light in weight, and embraces the following unusual features.

[illegible] with the [illegible] pod pattened to provide a unique means of rocking a 35mm camera, or rolling it over on the axis of its lens.

Second. It enables the photographer [illegible] position and then, with the touch of a finger roll the camera over and shoot in the vertical

position without losing framed picture area and camera's aplomb-balance.

Third. It works equally as well with the Trip Handle or the Gun Stock.

Fourth. In conjunction with the Camera Cradle, the Company has also developed a new tubular light bar attachment which is adjustable in both a horizontal and vertical plane, to permit "feathering" and "bouncing" the light. The manufacturer of this product claims that this accessory solves for all times [illegible] the camera as it is turned.

Price of the Standard Camera Cradle with choice of straight or curved Light Bar is [illegible].

NEW CATALOGUE OF MEDICAL MOTION PICTURES

[illegible] that [illegible] motion pictures [illegible].

The catalogue describes twenty-six films available on free-loan to physicians, medical students and nurses. Included are recently produced teaching films and filmed clinical reports on new drugs. In addition to scientific motion pictures for showing at medical meetings, the SKF film library includes documentary films suitable for showing to lay groups.

Copies of the catalogue may be obtained [illegible] SKF [illegible] or by request direct from the Medical Film Center, Smith Kline & French Laboratories, Philadelphia 1, Pa.

THE NEW CENTURY 35N CAMERA

A new [illegible] featuring EVC shutter settings, has been announced by Graflex, Inc., a subsidiary of General Precision Equipment Corporation. Known as the Century 35N, the camera joins the growing family of 35mm cameras marketed by the Rochester, New York, firm.

This newest Century provides a coated, f/2 six-element fully color corrected Ektomar lens set in a Copal EVC shutter synchronized at all speeds for bulbs and electronic flash. Focusing is by means of a large single window range-viewfinder with a bright line frame. A [illegible] color rangefinder permits critical focusing for both dull and bright scenes. The film transport consists of a short-stroke single-throw thumb lever that can be kept in a ready position about 20° from fully recessed to allow for rapid shooting.

The exposure value coupling instantly provides correct aperture and speed settings with one adjustment. The operator may select an exposure value determined by his meter or

he may use conventional f-stop and shutter combinations. A single ring adjustment is all that's required to set the shutter for conventional flash photography.

The rugged die cast metal body has a hinged back secured by a spring-loaded catch [illegible] the bottom of the camera, automatically [illegible] film. A film movement indicator assures that film is transporting, and a film counter which automatically returns to "S" (start) when the hinged back is opened, records the [illegible] remaining. A film reminder (type and speed) is mounted into the back of the camera.

Other features of the Century 35N include:

1. MX shutter with speeds from 1 to 1/500 second and Bulb plus self-timer.
2. Smooth top mounted shutter release with [illegible]
3. Double exposure interlock.
4. Price with f/2 lens [illegible]

Further information on the Century 35N 35mm camera can be obtained by contacting your nearest Graflex dealer or by writing to Graflex, Inc., Department 109, 3750 Monroe Avenue, Rochester 3, New York.

NEW ALPA 90mm f/2.5 LENS WITH FULLY AUTOMATIC DIAPHRAGM

The ALPA Alltar 90mm f/2.5 for the Swiss ALPA 35mm Single-lens reflex camera is a lens of long focal length which combines extreme definition with a large initial aperture and a fully automatic diaphragm, ideally suited for candid shots, distant views, as well as close-ups.

Conveniently set by a knob located on top of the lens mount, the automatic diaphragm permits easy composition and focus at full aperture, independent of the distance setting. As the shutter is tripped, the diaphragm closes AUTOMATICALLY to the preselected f/stop and re-opens AUTOMATICALLY again — instantly thereafter. The automatic diaphragm may be disconnected for viewing the depth-of-field.

The focusing range extends from infinity to [illegible]. The lens accepts the standard slip-in ALPA glass filters and reversible lens hoods.

Each ALPA is twice individually tested — by the lens manufacturer and again at the ALPA factory — for snug fit, resolving power, correct focus, contrast and overall illumination and carries an unconditional guarantee for highest optical performance.

Distributed by Karl HEITZ, Inc., 480 Lexington Ave., New York 17, N.Y., through franchised ALPA dealers, the lens retails for $ 175.00.

"SUPER-WITE" CYKO ADDED TO ANSCO'S PHOTOGRAPHIC PAPER LINE

Cyko, a brand new high-speed contact printing paper designed to meet the rigid requirements of the critical Commercial and Industrial Photographer has been released by Ansco, Binghamton, New York, the photographic [illegible] Aniline & Film Corporation.

Ansco Cyko Paper is designed for all types of Commercial and Industrial photography where "glass" prints are needed in quantity. [illegible] lights, and a remarkable ability to separate image tones from the deepest black to the whitest white, plus superb printing [illegible] Ansco Cyko the ideal contact paper for quality [illegible].

The four evenly spaced contrast grades have Ansco's exclusive brightening agent for [illegible] Minimum speed differential between grades permits increased laboratory efficiency. Ansco Cyko is offered in glossy single weight sur[illegible]

8" x 10"	100[illegible]
8½" x 11"	250[illegible]

The new paper is available through Ansco dealer.

SINAR REDUCING ADAPTERS OFFER QUICK FORMAT CHANGE

The format of the SINAR Interchangeable view camera can now be converted from 8x10", 5x7", 4x5", 2¼x3¼" and 2¼x2¼" and back by two methods:

1) Interchange of the entire SINAR back and bellows, or

2) by the new SINAR reducing adapters.

Changing the entire back and bellows keeps weight and bulk of the camera to a minimum and provides for the use of extreme wide angle lenses, but requires more time.

The attachment of the SINAR reducing [illegible] but is more suitable for fast and frequent conversions and takes but a few seconds.

Distributed in the U.S. by Karl HEITZ, Inc. 480 Lexington Avenue, New York 17, N.Y. through franchised SINAR dealers, the SINAR reducing adapters retail as follows:

[illegible]	[illegible]
8x10 to 4x5	99[illegible]
5x7 to 4x5	79[illegible]
4x5 to 2¼x3¼ and 2¼x2¼	12[illegible]

CONTRIBUTING MEMBERS

Dean C. Altman
A. Andreeko
Anonymous
Dr. Spencer Atkinson
William Atkinson
Harold C. Baitz
Dr. Edgar C. Baker
E. Lynn Baldwin
Donald L. Bechard
Tibor Benedek, M.D
Lester V. Bergman
Keturah D. Blakely
Leland Bowerman
Laurence B. Brown
Robert A. Brown
Charles G. Brownell
M. Bigelow Browning, M.D.
Joseph D. Brubaker
Perry Burgess, Jr.
Dr. Ralph Buchsbaum
William J. Cameron
Lardner Coffey
Philip A. Conrath
Howard Cradick
Joseph R. Dant
Capt. Stephen P. Dittmann
P. K. Duraiswami, M.D
C. Graham Eddy
Edward Entin
Louis A. Facto
Dr. E. J. Farris
Jack Fason
Prof. Deam H. Ferris
Louis Paul Flory
A. Wilson Footer, M.D
Jay T. Fox
H. Lou Gibson
Luther R. Gilliam
D. M. Glover, M.D.
Leo Goodman
F. W. Goro
Alex A. Gravesen
Avis Gregersen
Richard D. Grill
C. G. de Gutierrez-Mahoney, M.D.
Ferdinand R. Harding
Rudolph J. Henning
Leslie E. Hier
David Hilbrand
Constance Holland
Nathan S. Horton
Joseph T. Jackson
Homer Jones
M. George Jorgenson
Leonard A. Julin
John Kozie
T. C. Kramer
Victor R. Landi
John M. Langton, M.D.
Thomas J. Lannon
Mervin W. LaRue, Sr
Pierre J. LeDoux
Henry M. Lester
Albert Levin
K. Cramer Lewis
Gerald M. Lindley
David Lubin
James Mahaffey
Francis C. Mallory
Robert Mallory, III, M.D
William L. M. Martinsen
Leo C. Massopust, Sr
Thomas Masterson
Richard G. McClure
Leslie McWilliam
Dr. C. C. Mendenhall
Julius S. Mesiar
Bernard J. Moore, Jr.
Robert M. Moore, Jr.
Robert T. Morrison
Alex V. Mucha
Leonard Perskie
Dorothy M. Pinkham
Arthur Proetz, M.D.
Dr. William Quijano
Richard H. Ray
George W. Reis
Dr. Oscar W. Richards
Bernard Salb
Sidney Shapiro
Anne Shiras
Paul J. Showstark
Mose Smith, III, M.D.
William G. Smith, Jr.
H. E. Steadman, M.D.
M. Victor Stokes, II
Warren Sturgis
Joseph W. Tandatnick, M.D.
W. Jackson Taylor
William J. Taylor
Dr. Harvey E. Thorpe
Howard T. Toenniges
Howard E. Tribe
Harris B. Tuttle
Lloyd E. Varden
Dr. Roman Vishniac
Julius Weber
Allen Weinberg
Leonard Winograd
Lloyd A. Wolf
Thomas L. Wood
June Woodworth
Verlin Y. Yamamoto
Stella Zimmer

SUSTAINING MEMBERS

AGFA INCORPORATED
AMERICAN SPEEDLIGHT CORP.
ANSCO
ARKAY CORPORATION
CHARLES BESELER CO.
BRINKMANN INSTRUMENTS, INC.
E. I. du PONT de NEMOURS & CO.
EASTMAN KODAK CO.
ELGEET OPTICAL CO., INC.
EXAKTA CAMERA CO.
W. J. GERMAN, INC.
GRAFLEX, INC.
KARL HEITZ, INC.
KERN CO.
KLING PHOTO SUPPLY CORP.
POLAROID CORPORATION
POSTGRADUATE MEDICINE
J. G. SALTZMAN, INC.
SANDERS LABORATORIES, INC.
SIMMON BROS., INC.
S. O. S CINEMA SUPPLY CORP.
WILLOUGHBYS

FELLOWS of the ASSOCIATION

HAROLD C. BAITZ
JOHN J. BEITER
DR. ARTHUR D. BENSUSAN
PERCY W. BROOKS
LAURENCE B. BROWN
CHARLES G. BROWNELL
JOSEPH D. BRUBAKER
JOHN V. BUTTERFIELD
JULIAN CARLILE
LARDNER A. COFFEY
RALPH P. CREER
JANE WATERS CROUCH
J. W. CRUNELLE
CAPT. STEPHEN P. DITTMANN
S. C. DUNTON
C. GRAHAM EDDY
CHARLES E. ENGEL
DR. EDMOND J. FARRIS
LOUIS PAUL FLORY
JAY T. FOX
ARTHUR W. FUCHS
JAY M. GARNER, M.D.
H. LOU GIBSON
ALEX GRAVESEN
AVIS GREGERSEN
JULIUS HALSMAN
ALLEN HANCOCK
DR. PETER HANSELL
FERDINAND R. HARDING
CHARLES P. HODGE
PAUL H. HOLINGER, M.D.
JOSEPH HOMAN
NATHAN S. HORTON
MARIA IKENBERG
LEONARD A. JULIN
FRED W. KENT
THOMAS J. LANNON
MERVIN W. LaRUE
PIERRE J. LE DOUX
HENRY M. LESTER
ALBERT LEVIN
CHARLES LINDSAY
ROGER P. LOVELAND
DAVID LUBIN
ADOLPH MARFAING
WILLIAM L. M. MARTINSEN
LEO C. MASSOPUST, SR.
I. L. MATLOVSKY
JOHN A. MAURER
STANLEY J. McCOMB
HENRY M. MORRIS
DR. ROBERT OLLERENSHAW
WILLIAM F. PAYNE
LEONARD L. PERSKIE
DR. ARTHUR W. PROETZ
CHESTER P. REATHER
DR. OSCAR W. RICHARDS
MAURICE N. RICHTER, M.D.
HENRY ROGER
DR. GEORGE L. ROYER
ROBERT A. SAGE
SIDNEY SHAPIRO
ANNE SHIRAS
WILLIAM STEVENSON
WARREN STURGIS
WILLIAM J. TAYLOR
HOWARD E. TRIBE
HARRIS B. TUTTLE
LLOYD E. VARDEN
ROMAN VISHNIAC
JULIUS WEBER
JOHN E. WITHEE
VERLIN Y. YAMAMOTO
H. WOLFGANG ZIELER
STELLA ZIMMER

FELLOWSHIP PROCEDURE

Members may propose for Fellowship in the BPA other members whom they consider worthy of recognition. To be eligible for Fellowship a candidate must have been a member of the Association for five consecutive years and must possess one or more of the following qualifications:

Superior craftsmanship in still or motion picture photography of biological subjects.

Ability in photographic research in new methods or materials.

(These require submission of evidence.)

Meritorious contributions to biological photography overall through sustained organizational work.

Two sponsors are required. The sponsors should be well acquainted with the candidate's work and ready to furnish the Board with details of his experience and achievements. Those who wish to sponsor a member whom they believe to be eligible should request a Fellowship Application form from the Secretary of the Fellowship Committee: Mrs. Maria Ikenberg, University of Illinois, 904 W. Adams Street, Chicago 7, Illinois.

CONTENTS

JOURNAL OF THE BIOLOGICAL PHOTOGRAPHIC ASSOCIATION

Volume 27, Number 2 — May, 1959

AUTORADIOGRAPHY OF ELECTROPHORETIC STARCH GELS CONTAINING FE^{59} . . . . . Ross Jackson 49

PHOTOGRAPHY THROUGH THE STEREOSCOPIC MICROSCOPE . . . . . John E. Peterson 53

MEDICAL AND BIOLOGICAL ILLUSTRATION 60

PORTABLE SOUND-PROOF BOOTH Frank J. Reindl and Leonard M. Hart 61

AN INTRA-ORAL CAMERA VIDICON OR 16MM MOVIE . . . . . W. E. Morrison 65

IN MEMORIAM 68

PHOTOGRAPHY, A MEDIUM FOR EDUCATION AND RESEARCH Maria Ikenberg, Frank J. Reindl, Leonard M. Hart, and Louis Pedigo 69

NEW MEMBERS 72

A METHOD FOR DUPLICATING LANTERN SLIDES . Robert F. Albright 73

A BUDGET-MINDED METHOD OF PRODUCING 2x2 BLACK-AND-WHITE PROJECTION SLIDES . . . . . C. P. Taylor 79

28TH ANNUAL MEETING—PICTURE STORY 82

ASSOCIATION NEWS 84

NEW PRODUCTS 87

CONTRIBUTING MEMBERS 92

SUSTAINING MEMBERS, FELLOWS OF THE ASSOCIATION, FELLOWSHIP PROCEDURE . . . . . Inside Back Cover

PRINTING BY HAMMERSMITH-KORTMEYER COMPANY, MILWAUKEE, WISCONSIN

3

JOURNAL OF THE

Biological Photographic Association

Dedicated to the Science, Techniques and Applications Pertaining to the Photography of All Things Which Live or Which Have Lived

QUARTERLY OF THE BIOLOGICAL PHOTOGRAPHIC ASSOCIATION, INC.

Volume 27, Number 3 August 1959

JOURNAL *of the* BIOLOGICAL PHOTOGRAPHIC ASSOCIATION

EDITOR

EDITOR . . . . . LEO C. MASSOPUST

ASSOC. EDITOR . . . . . STANLEY WEINREB, Ph.D.

Marquette University
School of Medicine

Milwaukee 3, Wisconsin

EDITORIAL POLICY

Manuscripts should be sent to the Editor in legible form on 8½" x 11" paper, preferably typewritten, double spaced, with 1¼" margins on both edges as well as top and bottom.

Tables should be on separate sheets, each with self explanatory captions.

Reference notations in the text should be written as superscripts. Do not place in parenthesis. References should be on sheets separate from the text, numbered consecutively in the order of their appearance in the manuscript. Journal references should include: Author(s), title of article, volume number, page number(s), month and year. Book references: Author(s), title of book, edition, page number(s), publisher, year. Double space lines, triple space between references, 1¼" margins.

Illustrations should accompany the manuscript, preferably unmounted. They must not be larger than 14" nor smaller than 4" in maximum dimension, and should be properly proportioned to fit single column, double column or full page of the Journal. Identify each illustration on its back in soft blue pencil, giving title of paper, senior author and Fig. No. only. Legends should be on a separate sheet and each identified by Fig. No. matching its illustration. Double space lines, triple space between legends, 1¼" margins.

The editors reserve the right to reject manuscripts considered unsuitable. Major alterations of accepted manuscripts will not be made without permission of the senior author.

Special Note: If you have an idea or technique of importance to biological photography and need assistance in preparing the manuscript, write Editor.

OFFICERS OF THE ASSOCIATION

President — Leo C. Massopust, Sr., FBPA, Marquette University, School of Medicine, Milwaukee, Wis.

Vice President — Verlin Y. Yamamoto, FBPA, Medical Illustration Service, Veterans Administration Center, Des Moines 9, Iowa

Secretary — Mrs. Jane W. Crouch, FBPA, Grand Central P.O., Box No. 1668, New York 17, N.Y.

Treasurer — Albert Levin, FBPA, University of Pittsburgh, Medical Illustration Lab., 1016 H.P.B., Pittsburgh 13, Pa.

Opinions expressed by authors are not necessarily those of the Biological Photographic Association.
Copyright, 1960, by Biological Photographic Association, Inc.

OFFICIAL PUBLICATION OF THE BIOLOGICAL PHOTOGRAPHIC ASSOCIATION, INC.

Published at 733 North Van Buren Street, Milwaukee 2, Wisconsin. Editorial office: Box 1668 Grand Central P.O., New York 17, N.Y. Entered at the Post Office, Milwaukee, Wisconsin, under the act of March 3, 1879. Subscription price $9.00 per volume; foreign $9.50. Single copies $2.25 in the U.S.A.; foreign $2.40 in U.S.A. funds.

A Fallon Memorial Paper

Layouts for Medical Photography

H. LOU GIBSON, F.B.P.A.
Eastman Kodak Co.

THERE are two distinct problems in considering space for carrying out medical photography. One affects the private physician who wants to follow and record the progress of his patients by means of simple routine photographs made in the office or examining room. The other is the concern of institutional architects, superintendents, and photographic directors in planning new buildings or enlarging old quarters.

This paper deals first with the space requirements and the disposition of equipment in an examining room. Then it describes the shapes and sizes of areas, in an institutional photographic department, for specific purposes and for the best functional arrangement of large equipment and benches. It also gives the design features for locating various workrooms so that maximum production of the medical records in the least space can be provided.

Layouts in the Examining Room

The amount and type of space required for making office records will depend on the method of working. When a miniature or roll-film camera and flash equipment are employed for making up to full-length photographs of patients, the only space requirement is a sufficient unobstructed camera subject throw of about 10 feet. The background wall should be uncluttered

if necessary a medium-toned window shade, 4 or 5 feet wide, can be mounted for pulling down behind the patient, see Figure 1. There will be no dark room needed for loading films in this method. Color films and black- and white roll-films can be loaded in the light, so that a darkroom is only needed when the physician plans to make negatives and prints on the premises.

The width of the area need only be about 5 feet if a photoflash technique is adopted. However, when stand-lights are employed it is necessary to have space at the patient end of the area for

Figure 1

Figure 1. A medium-toned roller shade, hung from the ceiling is a useful background in the examining room.

the lights to be arranged. A clear square 7 x 7 feet in size would allow for lighting the full figure. The patient would be about in the center of this square.

A good way to save space when flood lighting is adopted is to attach lighting units to the walls semi-permanently. This provides a standard lighting that can give reasonably good results in the majority of cases. Four lights on each wall would offer a facility for unbal anced lighting with full figures when desired. Adopting fixed lighting units like this not only saves space and lighting time but also gives standard intensities, thereby simplifying exposure determinations.

The use of stand-lights can be made easier by placing marks on the floor. These indicate the locations for lamps in two or three standard lightings. Exposure charts for each can be attached to the wall behind the camera for ready reference.

A small closet nearby the patient end of the room is desirable for stowing away stand-lamps, fully set up. This saves a lot of time in getting ready for a photograph. Camera and film can be stored in a desk or cabinet at the other end of the room.

In employing a view-type camera with a ground glass focusing back, the same considerations as in the foregoing apply. However, there is the additional need for a tripod with these cameras and this entails about 2 feet more space for making full-length records. A place to store the camera on the tripod would save the time required for setting them up.

Film packs are available for making black-and-white negatives with most view-type cameras. These can be loaded in the light; sheet films for special purposes would have to be loaded in a darkroom, and color films too. A light-tight closet about 30 x 48 inches would suffice as a loading room in the event that a processing darkroom not be considered. The physician not confining his work to making exposures only, would have to arrange space for a processing darkroom, see page 103. Facilities for both negatives and prints would have to be provided.

Institutional Layouts

Whether the project represents a new photographic department or the enlargement of an old one, the considerations are the same. Of course, the former is the easier one in which to carry out the ideal arrangement. Careful planning is needed to make the best disposition of workrooms to provide dimensional space that permits an efficient layout for future as well as present needs.

The layouts offered here are intended to minimize mutual interference of several technicians within the department. The sizes and shapes of each type of room and also various ways of fitting units together are discussed. The 4-foot modulus, now generally adopted by architects, has been employed wherever possible; construction details, however, are beyond the scope of this paper. The information given should be adapted to specific needs and considered early in the planning. With forethought, an entirely adequate photographic facility can be provided in an area of moderate size

Personnel Factors

The size and arrangement of the department will be largely determined by the number of photographers and other personnel working in it. First, there is a chief photographer, who is capable of planning and doing all of the types

of work in the department. In small institutions his only assistant is the nurse or interne who brings the patient or helps arrange the specimen. Such an assistant need not be considered in enumerating photographic personnel. However, someone who receives the patients, who does much of the recording and scheduling, and perhaps assists with some of the photographic procedures is, of course, a member of the department and must be provided for. In larger institutions, one or more full time darkroom technicians are also employed. Teaching institutions often hire part-time students for many of the routine tasks. Occasionally, a member of the pathology department avails himself of the photomicrographic setup or an x-ray technician copies radiographs in the photographic department. A complete photographic facility, therefore, must provide for such workers; the term "photographer" in this article refers to them also. Art department personnel or quarters are not included, nor is a photostat room considered. Space can be readily added to the plans shown if such work be under the jurisdiction of the photographic department.

Photographic directors planning a department for the first time may be somewhat at a loss to know how much space to provide. It is not possible to be specific in this respect because of the many factors involved, but definite recommendations regarding space per photographer can be made. To help the director to decide how many "photographers" his institution is going to need, the following considerations are offered. First, there is the nature of the institution. A 1,000-bed hospital, for example, intended for a large number of orthopedic or plastic surgery patients will probably require more photography than a general hospital of the same size. A school associated with the institution will require a considerable amount of photographic work. If there is a large research division included, there will be need for much experimental photography as well as records for illustrating papers. The interest of staff members is also an important factor; it is safe to assume that their interest will grow if facilities are provided. The nature of the records has a bearing, too, because negatives and prints require more time than color transparencies. The volume of work turned out will also depend on the experience and efficiency of the photographers.

To give some additional guidance in the matter of personnel, 50 institutions of various sizes and types were investigated regarding their present and future needs. They were selected from a group known to be carrying out a photographic program, and the persons in charge of such activities co-operated in answering the questionnaire.

The finding should not be taken as a literal recommendation but rather as a guide. Once a decision has been made as to the number of photographers to provide for, suitable space can be selected from the suggestions in this article.

The conclusions that can be derived from the limited survey bear out the author's direct experience and are as follows:

(1) The ratio of photographers needed to the number of beds varies from 1 to 50 to 400, depending on the type of institution (see factors discussed in the foregoing). The average requirement is one photographer for every 225 beds.

(2) The majority of photographers make about 150 exposures per month;

however, one-sixth report 500, making the average 235. Slightly higher efficiency is indicated with two or more photographers than with one alone. However, the demand for photography and the convenience of the layout are factors involved in the amount of work done.

(3) For purposes of this survey, black-and-white negatives and color transparencies were considered as exposures. These exposures are about equally divided between negatives and color transparencies.

(4) The number of prints and lantern slides together approximates the total number of exposures in each case.

Department Features

The usual location of a photographic department is near other laboratories. When planning a hospital, proximity to the pathology laboratory and to the operating room should be considered. Sometimes the x-ray department supervises photography and nearness to this division may be desirable. It is also often necessary to consider the photographic quarters in relation to the art department. For specialized institutions, the source of the greatest number of patients may be the determining factor. An existing basement location should not be utilized unless the ceiling is at least 9 feet high and the ventilation satisfactory. In a building to be constructed the department can be underground if it can be kept dry and located near elevators. Finally, the appearance of the main facade of the building may have to be taken into account because many windows of the department will have to be blocked on the inside to exclude light.

The principal components of a photographic department are: a studio for photographing patients; a separate laboratory for making records of gross specimens and for photographing animals; and darkrooms for loading and processing films, color and black-and-white, and producing various types of prints and lantern slides. However, space must also be provided for several other functions, such as: photomicrography; copying; specimen preparation; print and slide finishing; chemical mixing; dressing; filing and storing; and office work. A toilet should be near-by or, preferably contained. The general relationship between working areas for all these functions is shown in Figure 2. This layout offers a simple, compact arrangement that permits one photographer to carry out a full photographic program.

When more than one person is to work in the department, more space is needed and separate rooms can be furnished for the various activities. In particular, it is often desirable to provide two or three darkrooms. Further on are shown layouts of the two most common types of space into which departments will have to be built. To understand the arrangements, it is advisable to approach the complete plan unit by unit.

Studios for Patients

The studio is considered as the area in which patients are photographed, although, in small departments, copying is often done there too. (Gross specimens should be photographed in a separate laboratory so as to avoid danger of infection.) For a large volume of work it will be desirable to provide two studios, one for full length studies and bedridden patients, and one for close-ups of the head, extremities, eyes, mouth, and so forth. To preserve

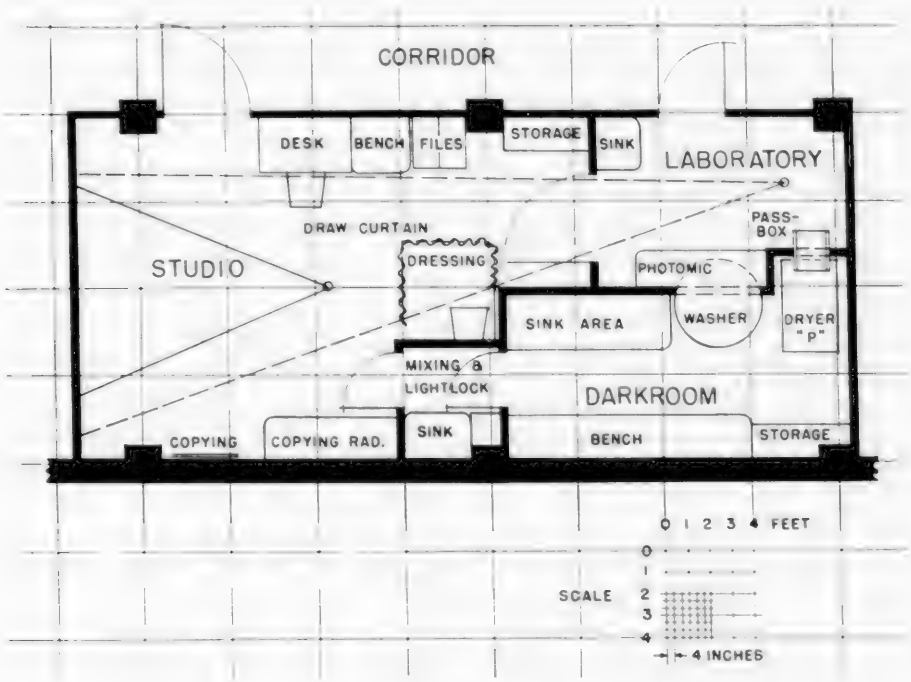


Figure 2

Figure 2. Minimum space for one photographer to carry out a complete photographic program of moderate scale. The studio, in addition to offering space for photography of patients, serves as an office and copying room. This is practical since only one activity at a time is assumed. Cabinets under the benches serve for additional storage. The solid V shows the angle of view for prone, full-length still photography with the patient on a bed parallel to the background. The dotted V shows the angle of view (width) of a 16-Millimeter motion-picture camera with a 1-inch lens for upright, full-length cinematography. Such motion-picture sequences can be made from the gross-specimen laboratory when the curtain of the dressing room is pulled aside. The gross specimen and animal laboratory contains a covered photomicrographic outfit and is large enough for a preparation sink. The darkroom is large enough for making negatives, prints, and lantern slides. A niche for the dryer is let into the laboratory. Part of the washer (covered, of course) projects under the photomicrographic bench, out of the way. A mixing room serves as a lightlock and also provides hand-washing facilities for the photographer. There is space for print finishing and filing in the studio. Extra lights can be stood in the corners at the back ground wall. There should be a nearby toilet.

privacy it is desirable to have only one patient at a time in the studio. It should also be possible to enter one studio without going through the other so that clothed patients do not disturb unclothed ones. As discussed further on, the two studios can well be combined for cinematography.

The chief feature of the floor area in the main studio is that it should be T-shaped to save space. The crossbar of the T can then be a patient area that runs the full width of the room at one end. The stem of the T provides room for the camera throw and need not be full width. Such an arrangement gives

sufficient space for cross-lighting the patient from either or both sides. Yet, it also offers, along the stem of the T, spaces for benches, special equipment for close-up photography, storage, and recesses in adjacent rooms. Figure 3 shows this principle and gives minimum dimensions.

The background wall should be unpaneled and smooth, preferably for its full width. In any event, a background 9 feet wide should be clear. The floor, at least in the patient area, should be about the same tone as the wall: the baseboard should be omitted and, perhaps, a cove substituted. Thus a strong and disturbing line of demarcation between floor and wall can be avoided in full-length studios (see Figure 4).

Whenever possible, the patient area should be accessible to the receiving and dressing rooms. It is also desirable to include toilet facilities for the patients off the studio. A doorway, 4 feet wide, for hospital carts and beds should open directly into the patient end of the studio. The camera area should be close to a darkroom, and to drawers or cabinets for storing photographic equipment and film. In this way there is no conflict between patient traffic and the technical activities of the photographer. It is also a great convenience to provide near the camera a passbox to the darkroom for the two-way transfer of films. A wash basin for the per

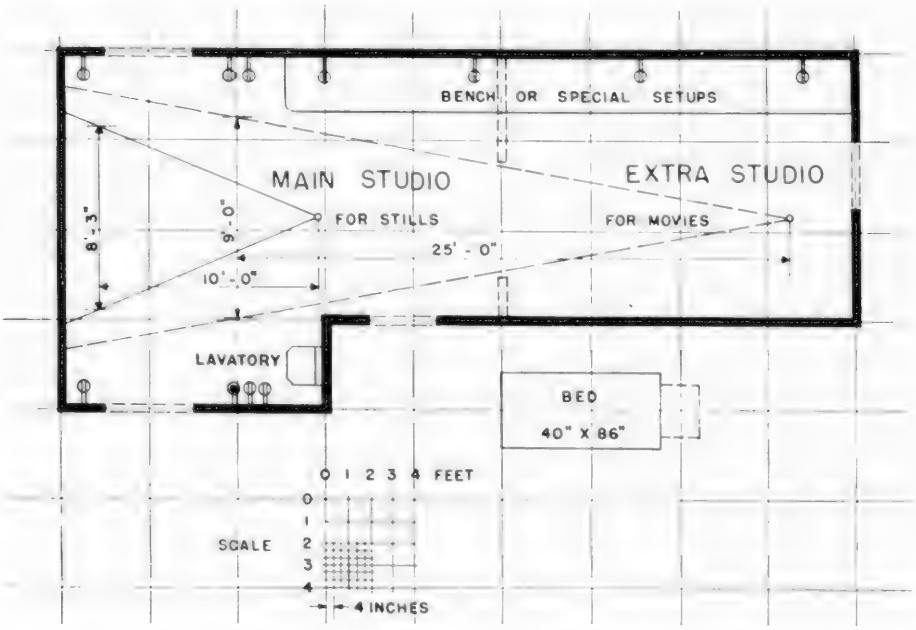


Figure 3

Figure 3. Floor space of a studio suitable for photographing patients; note "T" shape. Indents at sides can be used for benches or setups for photographing eyes, mouth, and so forth, within the studio, or for other rooms. Feasible door locations are shown as dotted lines. The small figure represents a bed and attendant.

sonnel is desirable in the studio, with a cabinet for sterile supplies. The solid V-lines in Figure 3 show the angle of view for full-length still photography with the patient lying on a cart and positioned 3 feet out from the back ground. The basic requirements for electric outlets are also shown: the usual 30-ampere wiring is suitable for most of them but one 60-ampere outlet for a spider box should be considered. Modifications in such features will have to be made to suit specific needs; examples are given in Figures 13 and 14.

CINEMATOGRAPHY As indicated by the dotted V-line in Figure 3, the length of a studio must be considerably greater for 16-millimeter motion pictures than for still photography. With the usual 1-inch lens, a working distance of 25 feet is required for the cine camera when the height of the field is 7 feet. A 36-foot studio allows 3 feet for the photographer behind the camera, 3 feet between subject and background for minimizing shadows, and 5 feet for the subject's movements. This is an extravagant area to tie up when motion pictures are not a regular photographic activity. However, by careful design it is possible to "add" length to the regular studio for the

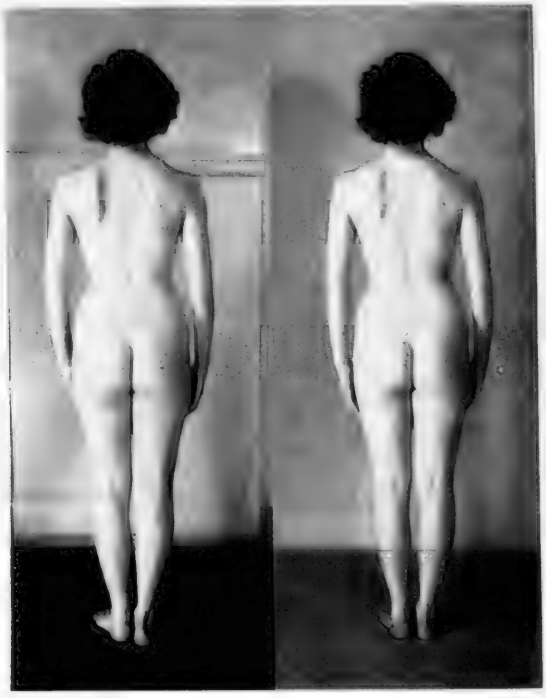


Figure 4

Figure 4. Background comparison showing the results obtainable with a continuous background from floor to ceiling and with a discontinuous floor and wall background.

occasional full-length motion-picture sequence by providing means for the photographer to back the cine camera into an adjoining room. As shown in Figures 2, 13, and 14, this can be accomplished without detracting from the usefulness of the other departmental elements. Often a simple measure like cutting a wide door, or having a curtain on an overhead runner, is all that is necessary.

It is possible, by utilizing a 15-millimeter, wide-angle cine lens, to reduce the requirements in studio length by 10 feet. However, the use of such a lens causes a rapid reduction in field height as the subject approaches the camera; therefore, it is preferable to employ the 1-inch lens for medical motion pictures of moving patients.

Of course, when motion-picture studies are a major phase of the photographic activity, the problem becomes specialized. Those requiring facilities for such work can readily increase, if necessary, the length of the studio shown in the plan otherwise most suited to their needs. A background 16 to 18 feet wide is desirable.

The practicality of magnetic sound tracks on 16mm films makes it desirable to provide a sound-recording area. This can be done most economically by the acoustic treatment of the small studio. Much of the action recorded will take place in the large studio; hence, a sound-proof window between the two studios will be necessary.

Laboratory for Gross Specimens

A separate room for photographing gross specimens should be provided and, if at all possible, it should not have an entrance off the studio. It is undesirable to work with fresh specimens in the studio and many patients do not like to see even fixed specimens being photographed; therefore, two photographers, one working with specimens and the other with patients, should not work in the some room together. And, if only one photographer is in the department, he could not stop work on a specimen to take care of an emergency record of a patient unless he had separate rooms.

In departments not having a great deal of work of any one kind, one man can photograph gross specimens in a fairly large room also accommodating photomicrographic and other setups. Even here, though, it is much more convenient to separate the activities, and the extra space required is usually only that needed for a partition.

Figure 5 shows a suitable area for photographing gross specimens. The

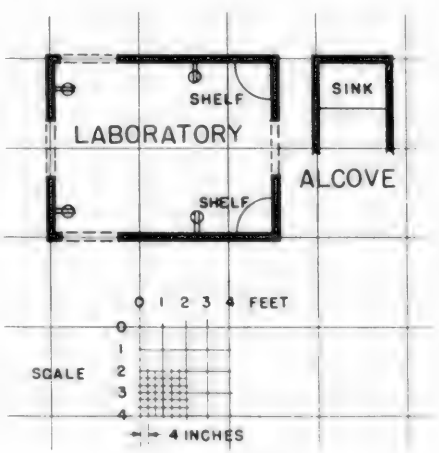


Figure 5

Figure 5. Floor areas needed for the gross specimen laboratory. Note small corner benches for specimens and instruments and for film holders and camera accessories. Also shown are feasible door locations. A suitable alcove for preparing specimens is given and this can be located where most useful.

room should be rectangular. Photographic preparation of the specimens should preferably be done in an adjoining alcove having a sink. Sufficient space is shown for the photographer to work between specimen and lights. It will seldom be necessary to place lights on more than three sides of the specimen. Therefore, it is feasible to build small corner benches at the end of the room where the camera is usually located. If the alcove is not handy to the camera area, one bench can be used for the specimen trays and can have cupboards or niches to hold instruments and solutions for last minute preparation of the specimens. The other is for convenience in handling the camera accessories. Their location will depend on the needs of the individual; at times it will only be feasible to have one such bench with a shelf underneath for additional temporary storage space.

Photomicrographic Room

A separate, long, narrow room is preferable for photomicrography. It can be closed off from other activities and thus disturbance and dust can be minimized. This permits the photographer doing considerable work in this field to be independent of others and to darken his room when he wishes. The room should be near a darkroom so that films can be processed readily, but it should not incorporate darkroom facilities because of danger to the microscope from processing solutions and vapors. In a busy department, however, it is desirable to include a small bench for loading films (see Figure 14). The room then has to be made somewhat larger and lighttight.

Figure 6 shows the basic space for photomicrography. The bench is 6 feet long and has a 2-foot clearance at the camera end and 1 foot at the lamp house end. This permits the extension of units beyond the bench when necessary. Also, it is possible to view the ground glass of the camera perpendicularly by going to the end of the bench. These clearances would not be needed with a vertical setup. The aisle is 3 feet wide, which gives an adequate passageway and affords sufficient space for bending down to get at drawers or cupboards under the bench.

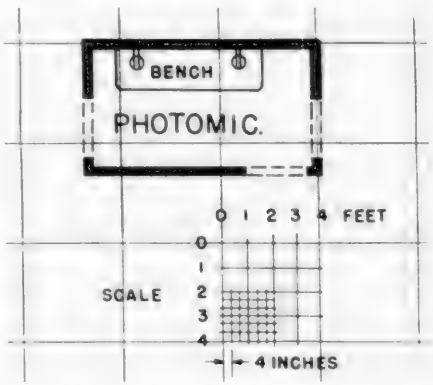


Figure 6

Figure 6. Room for photomicrography that permits working in the dark and leaving equipment set up. Optional location of door is shown.

Copying Areas

It is possible to have the setup for copying drawings and prints in the studio, especially in institutions requiring only a moderate volume of such work. The copying of radiographs should be done, however, in a room that can be darkened readily. It is often practical to provide a room for combining the two kinds of copying. Copying of either type can also be done in a large general utility room that incorporates

print finishing facilities, dryers, washers, or any other equipment that is only in sporadic use.

Copying charts and similar material calls for a copyboard about 28 by 36 inches, the center of which should be so located that there is a 4-or 5-foot clearance between it and the side walls: in this way, lights can be positioned at the requisite 45-degree angle. If lights for copying are to be built into the side walls, fluorescent lighting should be considered because of the compactness of the units. Such a provision is extremely convenient, since lamp stands and cords do not get in the way during other activities in the same room.

Copying radiographs can be done on a bench 6 feet long and 2 feet wide. A 3-foot aisle should be parallel to the bench. A 2-foot clearance at one end of the bench is desirable for viewing the ground glass perpendicularly.

Figure 7a shows suitable areas for copying. A room for copying radiographs that also incorporates a processing sink is desirable in a busy department because all the work can then be done in one room, thus reducing traffic in other rooms.

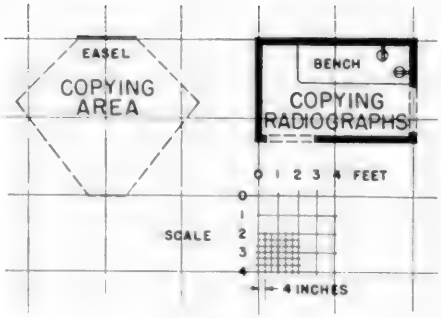


Figure 7

Figure 7. *Left:* Average area required for copying drawings and prints. The setup can be located in the studio or, if volume of work demands, in a special room. *Right:* A small room for copying radiographs. An alternative is bench space in one of the rooms that can be readily darkened. Doors can be placed anywhere except in the wall next to the bench.

Darkrooms and Utility Rooms

Except in the smallest departments, it is advisable to have at least two darkrooms—one for films and one for prints and lantern slides. If more than two persons are to utilize film darkroom facilities to any great extent, an extra one should be provided. It may also be necessary to consider a special darkroom for processing color films. A small room for loading film holders helps to reduce the darkroom traffic and keep unused films segregated.

Darkrooms should have a sink along one wall and a bench along the other. Any greater distance between bench and sink than about 3 feet for one occupant, or 4 feet for two, is unnecessary and tiring. Entrances should generally be at the end of the aisle because cuts made into the sides of the room wastefully reduce the length of the bench or sink. In general, sink and bench can be the same length. But if there is need for shortening one or the other a little, the following points should be kept in mind: In a film darkroom the sink should be longer than the bench because tanks and trays take up more room than is usually needed for loading and unloading films. On the other hand, in a printing room the bench should be longer because the printers and enlargers require considerable bench space. A sink for color printing, however, should be about twice as long as one for ordinary enlarging. The amount of color printing will indicate whether or not a separate room for this activity should be provided, such an

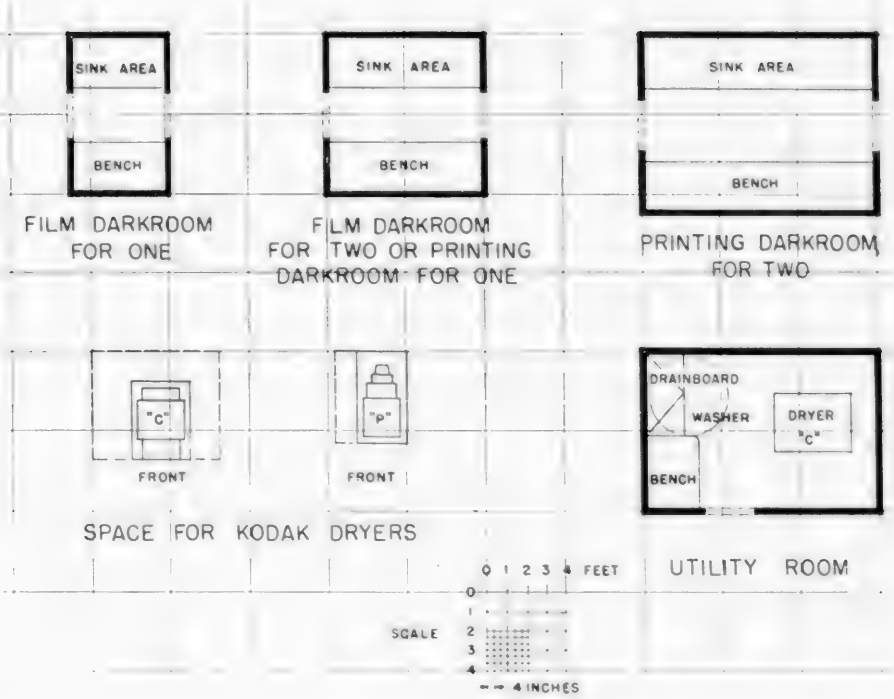


Figure 8

Figure 8. *Above:* Average darkroom sizes for one or two photographers. The most efficient use of space results when the doors open at ends of aisle. Safe-lights for both films and papers should be provided in a single darkroom. *Below:* A typical utility room that can be used as a lightlock for a print darkroom. Large finishing equipment is diagrammed and the dotted lines around each indicate the area that should be kept free. A bench or drainboard is needed for handling prints between washing and drying.

arrangement is desirable for keeping color-printing materials handy and clean.

The printing darkroom can be designed with a 3- to 4-foot aisle and contain equipment for washing or drying prints. To do this, however, niches for such apparatus have to be made into other rooms, such as storerooms; washers can very handily be placed through a wall to the finishing room. Alternately, a general utility room can be utilized for using and housing this rather bulky equipment. This helps efficiency in a busy darkroom considerably.

Figure 8 shows basic darkroom spaces. Many of the main darkroom details, such as water and electricity outlets, safe-lights, and shelves, are given in the section "Major Utility Features" at the end of this article.

Lightlocks

The entrance to the film darkroom should be lighttight, whereas a slight amount of weak light reflected into a printing darkroom upon entry and exit

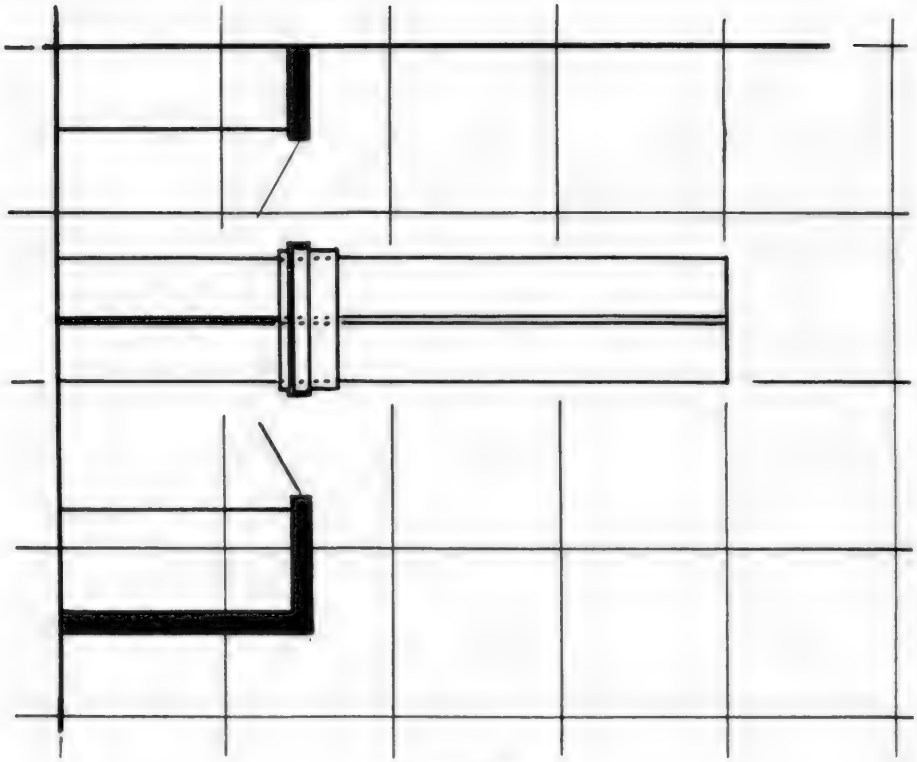


Figure 8a

Figure 8a. Frequently, since color processing of films and papers is becoming of greater importance in biological photography, adequate initial provision is wise because it saves time, space and money and leads to good quality. The most economical installation is shown here. A dual gas-burst sink services films (upper) and papers (lower). Most of the work is done in light so that the sinks should open into a utility room through a combination pass box.

does no harm. The most space-saving entrance to a film room is shown as "A" in Figure 9; an alternative, which requires more space, is given as "B". Either can be used also for the printing room and, in addition, "C" in Figure 9 is offered for maximum compactness and ease in passage. The latter is not dark enough for a film room unless a door is placed at one end. Interlocking devices are available for guarding against accidental opening of lightlock doors and they have proven practical.

An efficient way to save space in lightlocking is to open the darkroom into a storeroom, work room, or utility room of sporadic use. Such a room can be temporarily darkened while entering or leaving the darkroom. The number of doors in it should be reduced to a minimum to lessen accidental openings. Also the activities there should be chiefly associated with those of the darkroom so that the traffic is kept down.

Mixing and Loading Rooms

For maximum convenience and to protect equipment and materials against chemical fumes and dust, it is preferable to mix chemicals in a room apart from the darkroom or laboratory. The area need not be large because its use is sporadic. Obviously, the ventilation system should be such as to avoid transfer of air from such a room to the rest of the department.

About the same amount of space is required for a loading room for films when it is desired to reduce use of the film darkroom for this purpose. Figure 10 shows suitable areas.

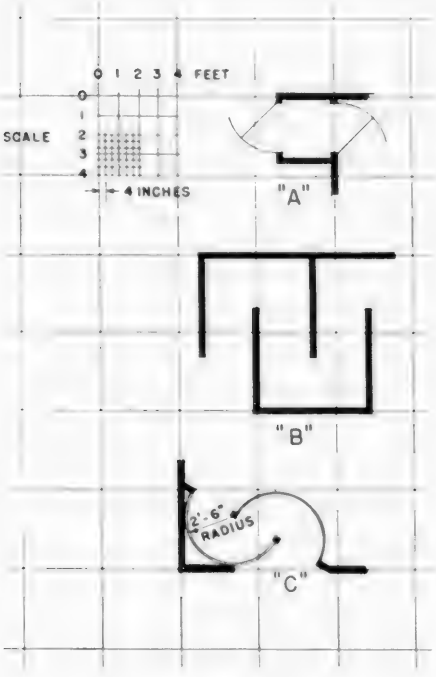


Figure 9

Figure 9. Suitable entrances for film and printing darkrooms.

Finishing Rooms

Prints may be carried from the dark room to the office for sorting, inspection, and final disposition; however, efficiency and convenience make a near-by finishing room more desirable. Facilities for sorting, spotting, trimming, mounting, and titling can be segregated there too. When a large number of big charts are routinely copied, a 4 x 8-foot table (accessible on all sides) is extremely handy for planning the work. The finishing room ought to be enlarged to take it. A finishing room can also be used for cine editing and titling, and for binding slides. The inclusion of projection equipment provides an extremely handy means for checking motion pictures and slides. A 14 x 17 horizontal illuminator, set into the bench, is most useful for comparing a series.

Minimum space for such a room is diagrammed in Figure 11; if more can be spared it would be advantageous. When much motion-picture work is done, a small "theater" is needed as well as additional space for editing.

Office

Figure 12 shows good office space in which planning and record keeping can

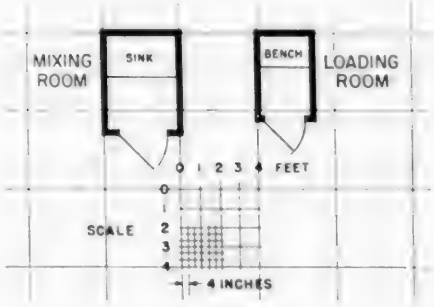


Figure 10

Figure 10. Plans for small rooms that can be utilized for mixing chemicals or loading films.

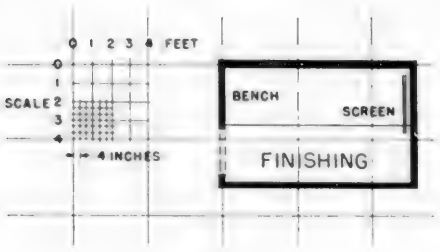


Figure 11

Figure 11. A finishing room for mounting and trimming prints, binding and projecting slides, and for editing of motion-picture film. Such a facility is particularly valuable in the larger departments. Doors can be anywhere except in the wall next to the bench.

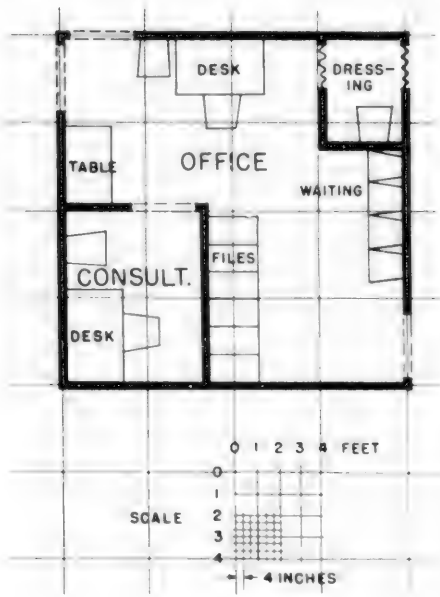


Figure 12

Figure 12. Office for a large department. A smaller office can be made by omitting the waiting and consulting areas shown. Washable curtains are used in the dressing room since they need less space than doors.

be done and patients can be received. In many institutions the negatives and master transparencies are filed in the photographic office quarters and room for them must be taken into account. In a very busy department, a small private office is desirable for the chief photographer; this permits personal discussions and the undisturbed scheduling of work.

Although patients are received in the main office and may have to wait there for a short time, it is advisable not to permit this receiving area to become a general waiting room for the patients the hospital waiting rooms are for such a purpose. The office should be plainly marked so that patients can find it without looking into other rooms by mistake and thereby exposing film or patients. In addition, the office should be as centrally located in the department as possible and, above all, should be readily accessible to the studio so that patients do not have to pass through other rooms in the department. A dressing room that has access to both the office and studio is desirable.

It is entirely practical to separate film and print darkrooms by placing the office roughly in between them. The reason for this is that it is customary for finished negatives to be routed through the office for checking, recording and printing instructions before prints are made. Also, reprinting is generally initiated from the office. Since prints form the bulkiest of the photographic results, the printing darkroom can be nearer to the office than the film darkroom This arrangement often allows the film darkroom to be near the studio and the studio next to the office.

In institutions where the volume of work is not great or where space has

to be reduced to the minimum, the office can be dispensed with. Most of its functions are then carried out in the studio. On the other hand, in large departments it is desirable to enlarge office space to provide a small desk for each photographer.

Department Layouts

The areas most frequently available for laying out a photographic department have three major shapes: long and relatively wide, with 16- or 18-foot bays; long and narrow, with 12-foot bays (both along the corridor); and an area more nearly square. The first is adequate but tends to separate the rooms. A long narrow space is somewhat difficult to manage and separates the rooms unduly when a large department is laid out. The last makes for the most compact arrangement.

A nearly square area can be obtained most easily by locating the photographic section at the end of a wing and terminating the corridor at the entrance to the department. In this way the corridor space, as well as the room areas on each side of it, can be utilized. Examples of laying out typical facilities are found in Figures 13 and 14.

Methods of applying the suggestions offered here will vary with circumstances. The general principles of group

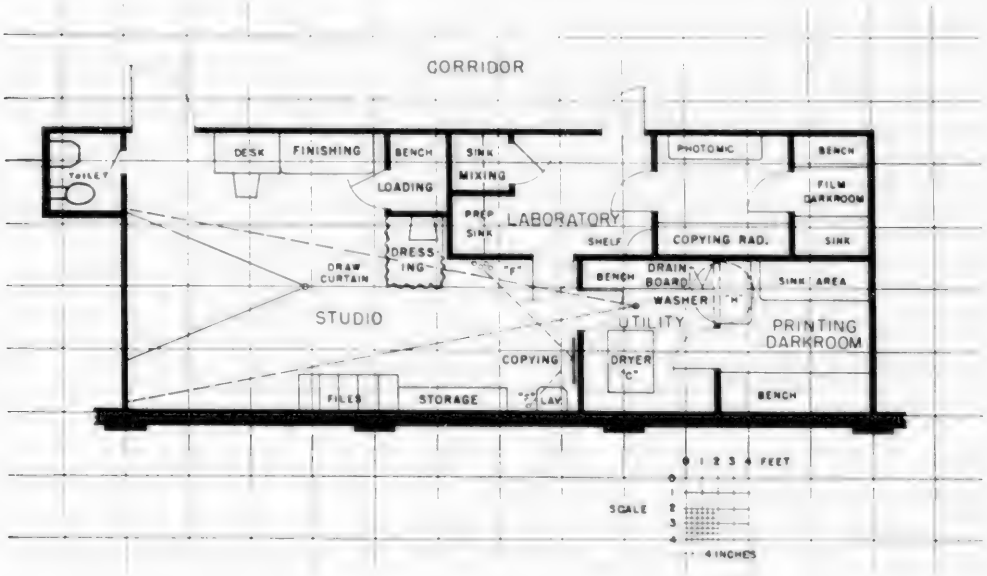


Figure 13

Figure 13. Compact department for one to three photographers, laid out in 18-foot bays. This incorporates separate darkrooms and a room for copying radiographs and for photomicrography, which is also a lightlock. Thus two or three photographers can work without interference. "F" demonstrates how built-in copying lights avoid having electric cords across the entrance to the utility room. "H" is a hinged cover for the washer. Sinks are located "back-to-back" to simplify plumbing. A corridor door to the laboratory precludes carrying gross specimens through the studio. An L-shaped sink could be substituted in the printing darkroom to provide sink space for color printing.

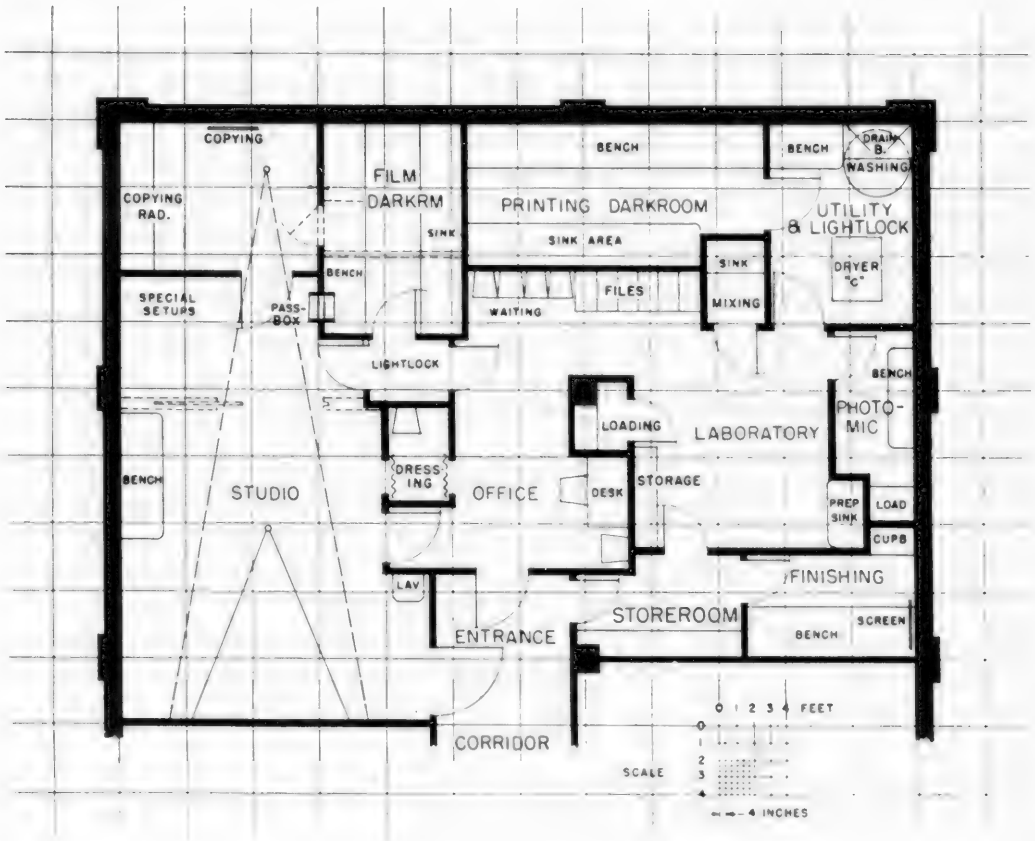


Figure 14

Figure 14. This layout for two to four photographers shows how locating the department at the end of a wing saves over 250 square feet of corridor space and provides a nearly square facility. Notice the central location of the office and the segregation of activities. The studio and copying rooms are on one side and the laboratory on the other. Free passage to the film darkroom exists from each side. There is adequate darkroom space for a moderate amount of color work. The film darkroom is large and can be divided into two, if desired, as shown by the dotted lines. Printing operations are provided for in one location and the utility room serves as a lightlock. There are no wasteful passages since paths from one room to another (from storeroom to laboratory or finishing room, for example) are through aisles needed in the rooms. Traffic through these aisles is associated with the activities in the respective rooms to avoid confusion. An entrance to the storeroom from the corridor eliminates the need for carrying stores or specimens through the office. Not enough space is available to incorporate a consulting office, but the finishing room could be used occasionally for personal discussions. Also, the desk is some distance from the waiting area so that it is quite private. Loading and preparation rooms contribute to efficiency. The studio can be made into two, as shown by dotted lines, if desired. The copying room can also serve as a sound recording room. Then the door to the film darkroom should be made lighttight and the lightlock kept open most of the time for traffic into the small studio. Usually it is the one going in that uses the lock.

Figure 15. Compactness in a small printing darkroom. Dryer and washer are let into niches. In a larger installation, the dryer should be outside and the washer lightlocked so that prints could be inserted in the darkroom and taken out in the utility room. For maximum water economy the bottom of the washer can be raised to the level of the edge of the sink in order to drain it into the pre-wash tray. The negative tank for washing lantern slides is here drained into the washer. If possible this tank should be placed on brackets so as not to take up costly sink space. The hinged drain board here serves as an inspection panel for wet prints to save the wall. It is lowered to form a wet bench and to support innocuous mixing. Notice that hose bibcocks eliminate "festooned" hoses.

ing the rooms are as follows: Patients should be confined to office and studios. The studio, the laboratory and photomicrographic room, and the copying rooms, are the basic camera units; film darkrooms (shared or separate) should be accessible to each with as little cross traffic as possible. The printing and finishing units can be isolated but should be near the office. Rooms should be arranged around the risers and supporting structures in such a way as to locate such members in unobstrusive corners. Sinks should be located back-to-back near supply lines. Further layout ideas are contained in the references 1-5.

Major Utility Features

In order to utilize space efficiently, all benches should have storage cabinets built underneath them. In most cases a single shelf should be placed

over the sinks: sometimes a cabinet is alternatively more useful. In this way the department can be kept neat and materials handy. Large quantities of stock items like films, papers, chemicals, and bulbs can best be stored in a specific storeroom. Working quantities can be on hand where used.

Electrical outlets are indicated in the main Figures. Others that should be considered are: A finishing room will need a duplex outlet at the bench for the dry mounting press and the slide projector. A mixing room needs one over the sink for an electric mixer. Some photographers may want a drop cord for a safelight in the loading room.

A drop-light should be hung over each darkroom bench. Two convenience outlets for extra safelight, timers, and mixers, should be available over each sink, and for the enlarger and printer at each bench top. An inspection light, controlled with a footswitch, should be hung at the washing end of the print room sink. This is best suspended on a pipe with a universal joint in it. An outlet controlled with the footswitch should be additionally included over the film darkroom sink so that the photographer can turn on an inspection light for wet negatives. This is usually a safelight lamp with ground or opal glass inserted in place of the filter. A reversal-exposure light is needed for processing color films

Good safelighting makes for efficient working conditions. One lamp for every six feet or fraction of darkroom length is recommended when used as indirect lighting, the most usual way. The ceilings should be painted white. These lamps should also be hung in a utility room used as a lightlock and in radiographic copying and photomicrographic rooms. The room in which lantern slides are made should be equipped, for maximum convenience, with two lamps in each location: the second one should have the safelight filter for working with lantern slides. Unless the photographer has expressed a different preference, lantern slides will be made usually in the printing darkroom.

Darkroom switches inside the door are best arranged as follows: master switch, high; white light, just below it; safelights and wall outlets, normal height. As a safety feature against accidentally stepping on the footswitch under safelighted conditions, a cutout switch could be installed next to the foot-controlled outlet or near the drop inspection light. The triple-switch arrangement is advisable for all rooms with safelights. A utility room used as a lightlock should have the three switches at the darkroom entrance and at least a safelight switch at the other door.

Darkroom sinks should be plumbed with a mixer; a retractable, kitchen-sink type, spray hose (hot and cold mixable); a tempered water faucet (if such is available); and a bib-cock for cold water at the washing end to take hoses. In this way slimy hoses are not permanently draped all over the sink. The sinks are preferably constructed from types 316 or 317 stainless steel. They should be eight inches deep and have a three-inch high cypress rack in the bottom. This rack should have rounded slats to minimize splashing. Stand pipes and compartmentization provide water baths for color processing.

Construction materials for the department will depend on the technical selection of the architect. In general, terrazzo or asphalt tile are good selections for the floors. Bench tops can

well be covered with plain green linoleum.

There are many minor details, such as racks and shelves in the darkrooms, that are usually planned by the photographer who is to work in the department. Photographic manufacturers can supply information on the many specific equipment requirements.

(The Author is indebted to Medical Radiography Photography for much of the material in this article).

REFERENCES

1. Harding, F. R.: The organization and equipment of a photographic department. Radiog. & Clin Photog., 14: 2-7, (#2, April) 1938.
2. Zimmer, Stella: A modern photographic division. J. Biol. Photog. Ass., 7: 153-156, (June) 1939.
3. Stanford, Brian: The hospital photography department. Lancet, 2: 299-301, (Aug. 31) 1946.
4. Gibson, H. L.: Planning the medical photographic department. Med. Radiog. & Photog., 24: 66-78, 96, (#3) 1948.
5. Longmore, T. A.: Medical Photography, Radiographic and Clinical, 8 , 4th ed., pp. 1008, London. 1949.

EDITORS NOTE

This is one of a series of papers published in memory of Dr. J. Fallon, who originally conceived the plan of assembling a complete volume on all subjects pertaining to biological photography. The manuscripts were prepared by outstanding men in the various categories. It is therefore fitting that we publish these papers, which have been brought up to date, as a tribute to Dr. J. Fallon.

Medical Photographers from Nine Mid-Western States and Canada to meet in Milwaukee, Wisconsin

The Second Midwestern Sectional Meeting of the Biological Photographic Association will take place in Milwaukee April 1st through April 3rd at St. Francis Hospital. Photographic specialists in medicine, dentistry, biology, and other sciences will attend, representing medical and dental schools, hospitals, research institutions, and science centers from Canada and nine mid-western states (Illinois, Iowa, Kansas, Minnesota, Missouri, Nebraska, North and South Dakota and Wisconsin). An interesting program is being planned with Papers and Discussions.

A salon of color and black-and-white photographs will feature displays of clinical and specimen photography, photomicrography and natural science.

MEDICAL AND BIOLOGICAL ILLUSTRATION

CONTENTS

APRIL, 1959

Victorian Clinical Photography.

A Technical Close-Up Outfit . . . . . D. L. Cullen

Time-Lapse Film Study of Cell Reaggregation . . E. C. A. Lucey and A. S. G. Curtis

A Method of Vascular Display by Silver Impregnation . . . . P. S. Boulter and A. G. Parks

Plastic Animation in Medical Kinematography . . . . . H. J. Versteeg

Use of Films in Teaching Anatomy in the United States and Canada . . . . . J. E. Markee

Equipment and Methods:

- Johnson Optiscope 1000 MK II Projector.
- New Hand-drawn Letraset Faces.
- New Shading Media.
- Production of Monochrome Prints from Colour Transparencies by the Polaroid-Land One Step Process.

Annual Subscription $10.00

Published Quarterly by the

BRITISH MEDICAL ASSOCIATION

Tavistock Square, London, England

SEND ORDERS TO MEDICAL MARKET RESEARCH LTD., 280 MADISON AVENUE, NEW YORK 16, N.Y.

Journal of the Biological Photographic Association Vol. 27, No. 3 August, 1959

Smooth Transition Techniques in 16 mm. Film Editing

HERBERT A. FISCHLER, B.S., M.A.

Chief Medical Photographer
Department of Laboratories and Isaac Albert Research Institute of the Jewish Chronic Disease Hospital, Brooklyn 3, New York.

WEBSTER[1] defines a transition as a passage from one place, state or stage of development to another. In motion picture editing, the simplest and most commonly used transition technique is the straight cut, or splice, where one scene directly follows another. Julin[2] recommends the use of dyes to produce fades to blend the abrupt changes at splices.

The synthesis of time and space is accomplished by such mechanical transitions as the fade-in, fade-out, wipe and dissolve. The fade-in introduces a scene or activity, the fade-out ending a segment, sealing off the action which preceded the action that follows. A fade-out followed by a fade in signifies passage of a length of time, while the dissolve conventionally indicates a very short passage of time, or a flash-back. A wipe may be used instead of the dissolve.[3] To maintain uninterrupted continuity, it is necessary to avoid the sudden appearance of people or objects in the cinematographic field. It is esthetically more desirable that they be shown coming from somewhere off frame and going somewhere. Clean screen entrances and exits eliminate awkwardness and can be produced by mechanical transitional effects.[4] Such effects are usually accomplished by secondary optical printing in the film laboratory by various techniques[5] or in the camera directly by the use of the variable shutter.[5] Another camera technique for fade-in and fade-out is the dimming of lights, using a rheostat.[7] However, this is impractical when using color film since the use of a rheostat changes the color temperature. A technique used in our laboratory is to stop down the lens diaphragm to f/22 while shooting. After a few tries, this can be done very smoothly, fading out as rapidly or slowly as desired. Fade-ins work just conversely, starting at f/22 and opening the diaphragm to the shooting aperture. This technique is most effective when photographing at large openings, and least effective if there are hot reflections on metal.

As desirable and effective as these optical procedures may be, it is unfortunate that they are not technically available to all who would use them. Budgets do not permit printing of many films and it is not feasible to print short presentations that will be used once or twice. Still the need for optical effects is present. Cameras with variable shutters are not available to all, and even if they are, it is not always possible to obtain accurate timing to produce such editing in the camera. The answer, therefore, is some inexpensive method

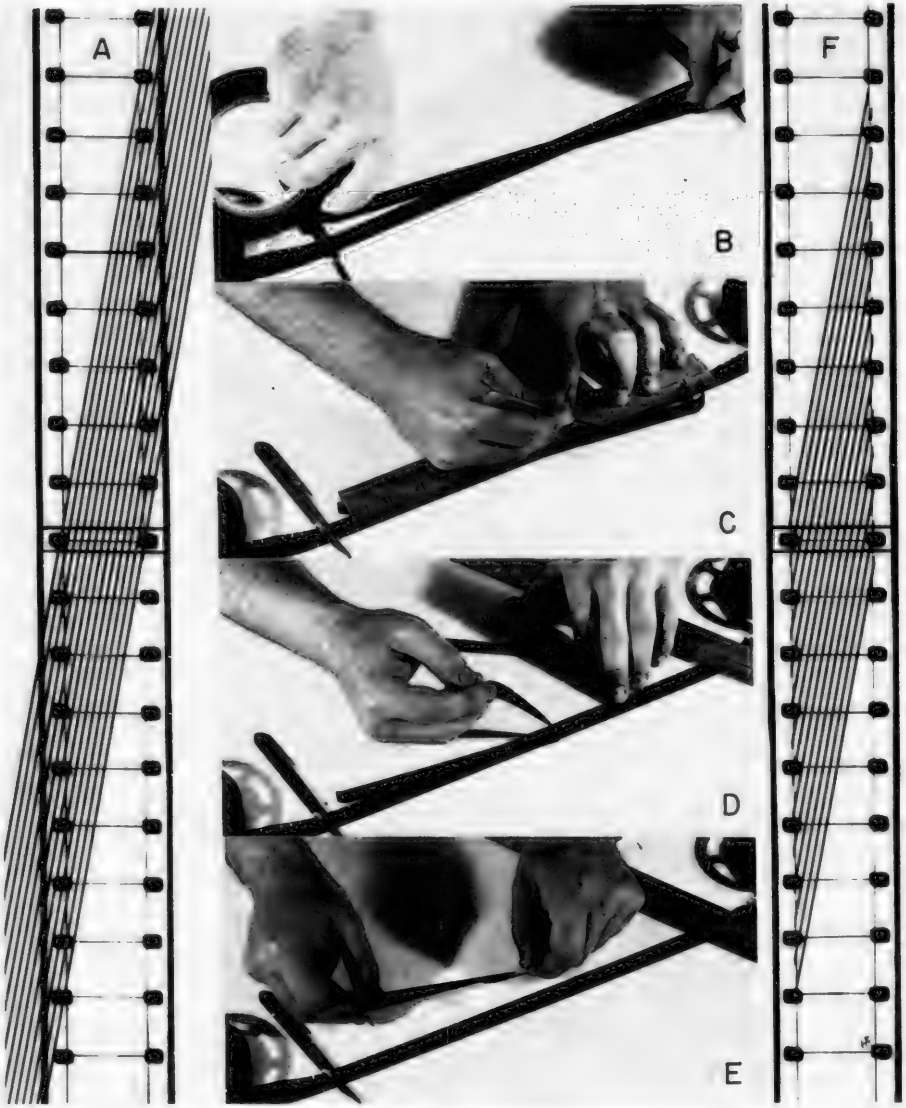


Figure 1A Diagrammatic illustration of placement of black tape for the wipe.

Figure 1B The black tape is placed at an angle to the film, completely covering the splice, going out of frame at both ends.

Figure 1C Using a steel-edged ruler, the tape is scored by a scalpel for removal. Exercise care not to cut through the film.

Figure 1D The excess tape is peeled off the film.

Figure 1E With the excess tape removed, a perfect wipe off and wipe on remains.

Figure 1F The completed wipe is diagrammatically illustrated.

of accomplishing these effects on the editing table.

Gibson[5] proposed a technique for making a wipe-out and wipe-in by using triangles of black tape directly on the film. We use the same theory of black tape wipes but employ a different technique.

Black scotch tape (½") of the desired length is placed diagonally on the film. (Figs. 1A, 1B). The full width of the tape must be placed across the splice, and the ends must go out of frame at either end. A steel edged ruler is placed along the sprocket holes and the tape is scored with a razor or scalpel. (Fig. 1C). Care must be exercised that the film is not cut. The tape is then peeled off the sprocket area (Fig. 1D) leaving a wipe-off and wipe-on. (Figs. 1E, 1F). The speed of the wipe is controlled by the length of tape used. It can be as short or long as desired

This technique, however, produces only wipes to and from black. A method of cross wiping from picture to picture more closely approximates the dissolve and is more desirable With the introduction of perforated mylar splicing tape, a special splicer was designed which permits picture to picture wipes, side to side and center out or sides to center.

Materials and Method:

3 pieces of plexiglas 4" x 10"
1 mounting board 4" x 10"
1" x 6" double surface tape
40 ¾" brads
4 2" finishing nails

With the mounting board sandwiched between 3 sheets of plexiglas, holes are drilled into each of the four corners and a finishing nail is inserted into each hole to insure registration of future holes. Double surfaced tape is used to fix a length of film to the plexiglas for the location of the sprocket holes. Using a #56 drill, holes are drilled through the sprocket holes, plexiglas and mounting board for the location of the sprocket pins. (Fig. 2). The brads are placed through one sheet of plexiglas and the mounting board. These brads, held in place by press fit, are cut off ⅛" above the mounting board (Fig 3A). With a flat file, the brads, which

Figure 2 — A piece of motion picture film is mounted on the strips of plexiglas and mounting board. Sprocket holes and holes for the sprocket pins are drilled, using the sprocket holes in the film as guides.

Figure 3A — The splicer complete, with one row of sprockets, which can accept either sound or silent perforated film.

are used as sprockets, are tapered to facilitate the easy acceptance of the sprocket holes. (Fig. 3B).

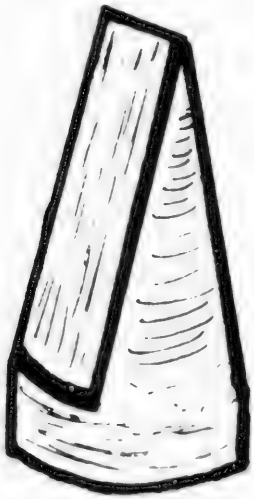


Figure 3B The tapered brad used as a sprocket pin.

The remaining two pieces of plexiglas are cut for use as templates, one cut diagonally for the side to side wipe (Fig. 4A), and a V notch cut into the second for the center out or sides to center wipe (Fig. 4B).

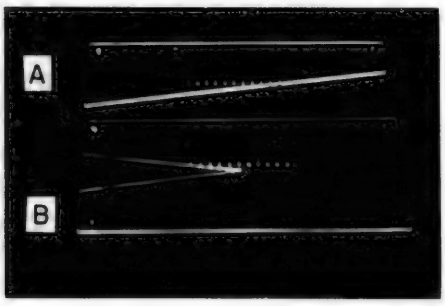


Figure 4A Plexiglas template for side to side wipes.

Figure 4B – Template for center in or center out wipes.

Technique:

The film to be spliced is placed on the splicer, lining up the sprocket holes. The two lengths of film are overlapped for the length of the wipe, and taped to the splicer laterally to the wipe (Figs. 5A, 5B). The template is placed on the splicer, the sprocket holes in the template aligning with the sprocket pins (Fig. 5C). The film is cut diagonally with a scalpel blade razor, or Exacto knife against the template (Fig. 5D). After discarding the triangular ends of the film, a length of perforated mylar splicing tape is placed over the wipe (Fig. 5E).

The film is then turned over, and mylar is placed on that side. It is imperative that the mylar tape extend at least one frame beyond the wipe in either direction so that the splice does not catch while running through the projector.

The wipes can be varied from right to left or left to right, or from center out to sides in, merely by reversing the direction of the film in the splicer prior to cutting. Therefore, with this splicer there are four different types of wipes possible. Four different wipes to and from black are also possible (Fig. 6). Other variations can be secured by varying the length of the wipe

Summary:

Some methods of obtaining smooth transitions easily are described, either by producing them in the camera while shooting, (fades in and out), or on the editing table by the use of black tape or perforated mylar and a special splicer that can easily be constructed.

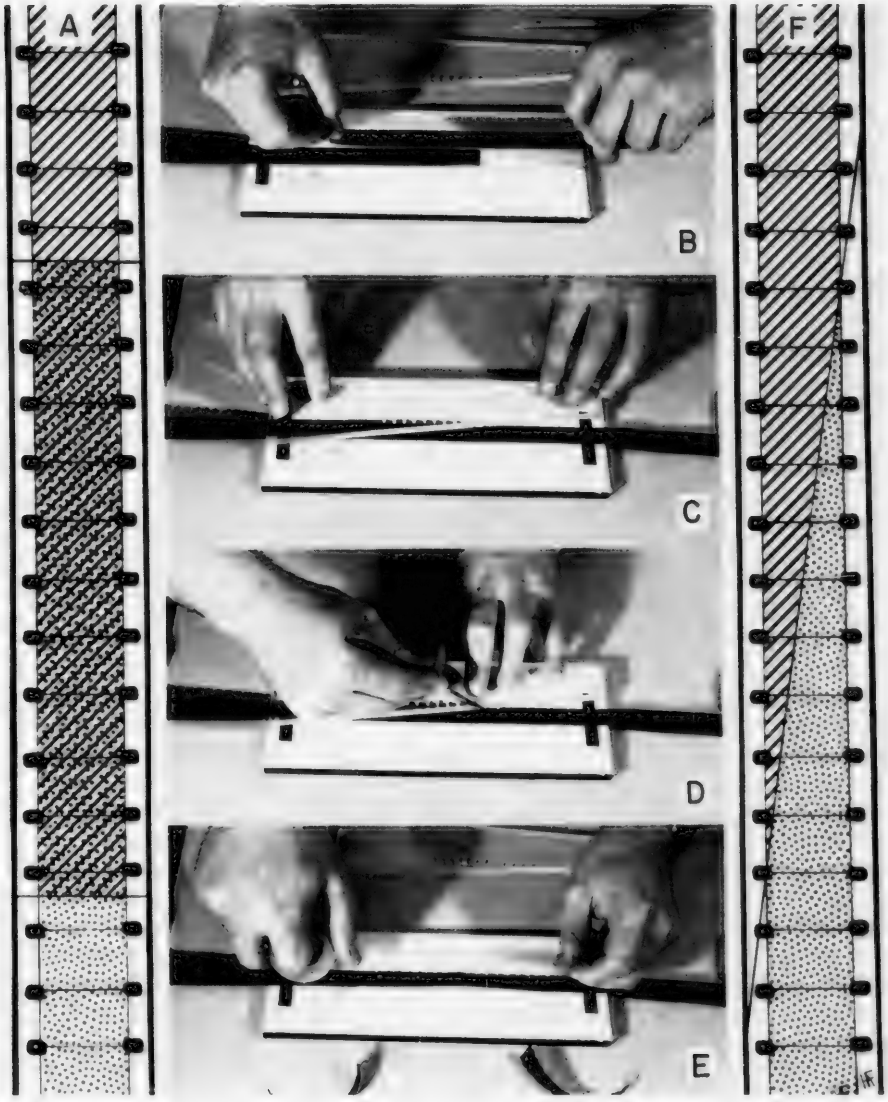


Figure 5A Diagrammatic illustration of the overlap of the two films, preliminary to making the splice.

Figure 5B After placing one length of film on the splicer, ending beyond the splice point, the second length is placed overlapping the first, extending beyond the length of the splice.

Figure 5C The template is placed on the splicer.

Figure 5D The film is cut with a scalpel against the template.

Figure 5E Perforated mylar tape is placed on both sides of the film, overlapping both ends of the splice.

Figure 5F Diagrammatic illustration of the completed wipe.

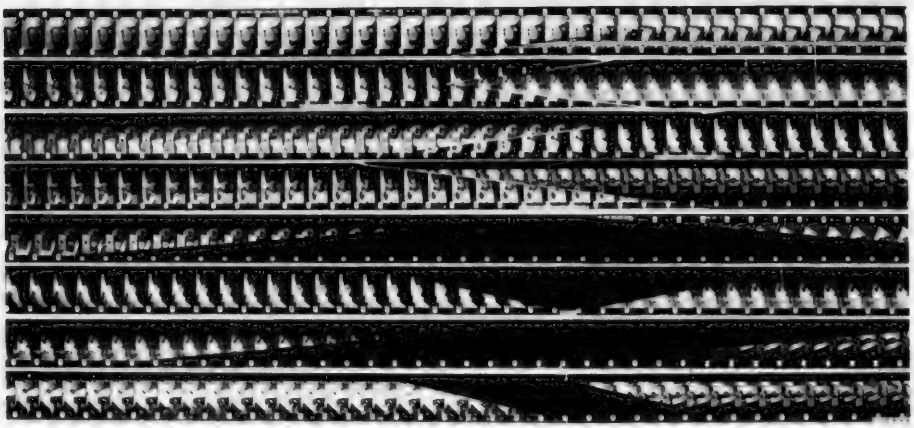


Figure 6 Eight different types of splices described in the text.
Figure 6A — Center out wipe.
Figure 6B — Side to center wipe.
Figure 6C Left to right wipe.
Figure 6D — Right to left wipe.
Figure 6E — Right to left wipe off, left to right wipe on.
Figure 6F Left to right wipe off, right to left wipe on.
Figure 6G Left to right wipe off
Left to right wipe on.
Figure 6H Right to left wipe off.
Right to left wipe on.

Acknowledgments

The author wishes to thank Benjamin Levine, Manual Arts Therapist, for his aid in the fabrication of the spheer. Morris Nakrinsky for his photographic aid, Dr. Stanley M. Aronson for reading and editing this paper, and Mrs. Tillie Milder for typing the manuscript.

REFERENCES

1. *Webster's New Collegiate Dictionary*, G. & C. Merriam Co., Springfield, Mass., 1953.
2. Julin, Leonard A. *The Editing of Surgical Motion Picture Films*. Journal of the Biological Assn 8:3, 1940 p. 128-131.
3. Reisz, Karel. *The Technique of Film Editing* Focal Press, London, 1953
4. Gaskill, A. L. & Englander, S.A., *How to Shoot a Movie Story. The Technique of Pictorial Continuity*. Morgan & Morgan Inc., N.Y., 1959
5. Spottswoode, Raymond; *Film & Its Techniques* University of California Press, Berkeley & Los Angeles, California, 1952
6. Gibson, H. Lou, Making Dental Motion Pictures *Dental Radiography & Photography*, 26:1, 1953 p. 9-19.
7. Dimmer Circuits for Photographic Lamps. *Radi & Clinical Photography*, 19:82-85 #3, 1943
8. Gibson, H. L., Ibid.

Caution on Cleaning Lenses

The *British Journal of Photography* quotes the advice of Leitz factory technicians on the use of treated lens tissues or solutions on coated lenses. After intensive laboratory tests the technicians urged extreme caution. Many of the substances used to treat tissues left traces of grease on lens surfaces. Some produced small scratches. Continued use could therefore remove part of the lens coating. Recommended: if dust appears, try first to remove by brushing the lens surface gently with a small hair brush. If this fails, try untreated lens tissues.

Journal of the Biological Photographic Association Vol. 27, No. 3 August, 1959

Low Power Stereoscopic Photomicrography

PHILIP H. MOTT

Technical Head, Audio-Visual Studio, Queen's University

THE apparatus described here has been designed for the purpose of taking low power, color, stereo photo micrographs of clinical findings in rou tine cervical examinations.

There are several colposcopes on the market which provide the gynecologist a means of low power binocular inspec tion of the cervix and at least two such instruments which incorporate the 35mm. camera for making single photo graphs through a separate lens system. The architectural features of the cervical epitheleum are of clinical importance to the examiner, therefore, three di mensional photographs seem more de sirable as a teaching aid.

As the plan for designing this equip ment developed, certain conditions be came a part of the plan. First, the stereo pictures should be made by means of the microscope optical system only. That is, the camera would be no more than a shutter and film housing as in conventional photomicrography. Second, both pictures of the stereo pair should be taken simultaneously, and third, a single light source should pro vide illumination for both inspection and photography.

The low power dissecting microscope, together with a 35mm. stereo camera, obviously would provide the basic equipment with which these conditions could be met. Other workers have employed this same combination but, so far as this writer can determine, in all cases the camera lenses (focused at inf.) have been retained on the camera and in addition, two ophthalmic prisms are required to change the direction of the two light paths so that the rays are parallel instead of divergent. Lester and Richards state that this arrangement results in a considerable loss of magni fication on the film, depending upon the focal length of the camera lenses. They further state that, in the case of lenses of 35mm. focal length, the film magni fication is about 1/7 of the normal mag nification produced by the microscope ocular. It goes without saying that this extra glassware accounts for a consider able light loss and makes it necessary to have an extremely powerful light source for adequate exposures with color film.

Further, the lens diaphragm serves no useful purpose because stopping down will not increase the depth of field but instead will vignette the film image. In the face of all this evidence, logic dictated the main condition of the plan: the film image to be formed by the microscope only.

The Edixa Stereo camera was selected for the following reasons:

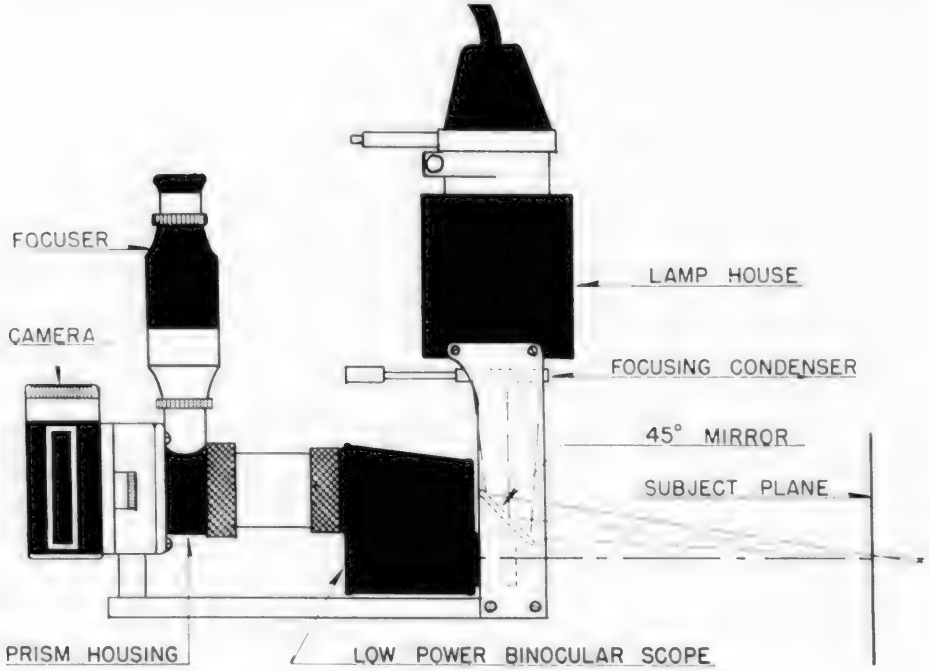
1. An all-metal body which would facilitate machining and modifi cations.

2. Between the lens shutters in tandem with one a driver and the other a slave.
3. Economically priced.

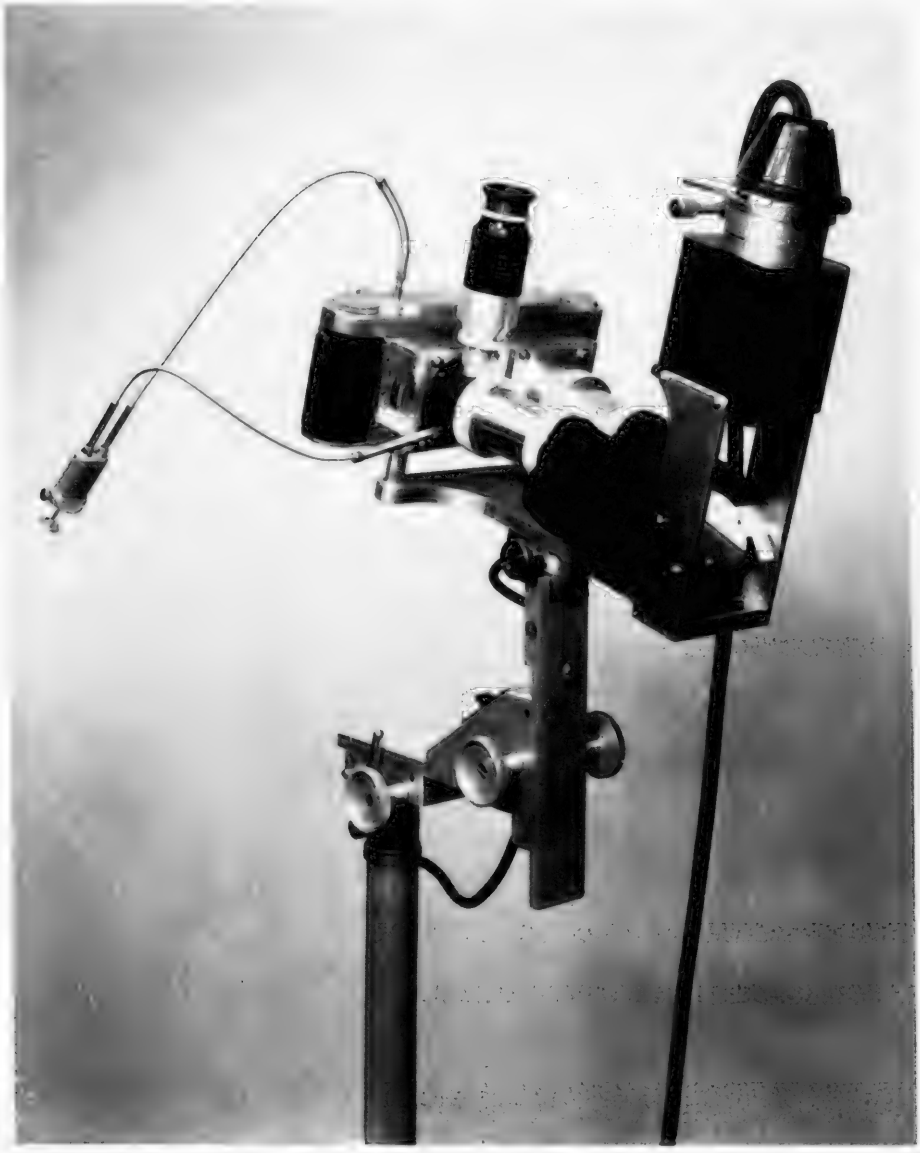
In conventional photography, light from the subject enters the front element of the lens in a converging cone and exits from the rear element in a diverging cone. Because of this, the shutter, at its maximum opening, has a diameter somewhat less than the diagonal of the film frame. In order to produce a film image which would completely fill the stereo frame, the lens-shutter assemblies were stripped of their iris diaphragm and lens elements and the maximum aperture of the fully open shutters was increased by machining the housing openings to as great a diameter as possible, and by judicious trimming of the shutter leaves themselves.

The shutter for this camera provided only the very limited selection of 1/25, 1/75 and 1/200 second exposures and it was felt necessary to increase this range particularly in the slower speeds. Through the manufacturer it was possible to obtain another style shutter which provides the full range of speeds from 1 second to 1/300. Both are compur shutters and both have interchangeable components. A fortunate set of circumstances solved an important problem.

The camera is permanently attached to a Leitz low power (X 10) dissecting



STEREO CAMERA — MICROSCOPE ADAPTATION



STEREO CAMERA MICROSCOPE ADAPTATION

microscope by means of the specially made housing and ocular tubes as shown in the accompanying illustration.

The front face of the shutter housing is machined as a dihedral angle to fit the angle formed by the tube flanges and still allow horizontal and vertical adjustment of each image. This is an important adjustment because the two images must be separated by the proper inter-ocular distance.

The design of the shutter housing is such as to permit access to both the sychronizer plug and the shutter speed selector.

Focusing is accomplished with Monocular vision through a prism in one side of the binocular scope. This is the Leitz focusing telescopic viewer which is normally intended to be used with the Leica camera when it is used for photomicrography. Only the prism and its housing were used and the magnifier eyepiece was replaced with a ground glass operating on a screw adjustment which makes it par focal with the film image. A Bausch & Lomb magnifier was placed above the ground glass to allow more critical focusing. A tandem cable operates the shutter and swings the prism out of line.

The third condition imposed upon the design of this camera called for a single light source for both viewing and exposing film. The requirement was met by using the Leitz Orthalux illuminator, which was mounted above and at right angles to the optical axis of the microscope objectives. The 50v. concentrated filament lamp in this illuminator is fed 6 amp., which provides sufficient light for an exposure time of 1/25 or 1/10 with color films of 100 A.S.A. rating. The light is directed along the objective axis by a polished chrome mirror, mounted at 45 degrees, above and slightly in front of the objective apertures. The mirror position can be adjusted to bring the spot of maximum brilliance exactly into the subject field. An adjustable condenser is used to focus the light source and centering screws on the lamp socket ensure centrality of the filament.

This complete unit is mounted on the pedestal base of the Kern--Swiss made colposcope and is interchangeable with the regular Kern binocular scope.

In operation the Kern equipment is used for the routine examination and when a case worthy of a photograph is encountered, the camera is mounted on the pedestal stand and focused upon the important area. This set-up, which covers a field 10mm. square, is excellent for stereophotography of minute specimens in other sciences such a botany, entomology, etc.

The writer wishes to acknowledge the invaluable assistance of Mr. R. D. Bradfield, instrument maker at Queen's University.

Satellite Tracking

Special German lenses with rare earth elements have contributed to the development of new giant satellite-tracking cameras by American research specialists, according to a scientist from the Schott Glass Works, who recently visited the Leica people in New York.

PAN AMERICAN MEDICAL ASSOCIATION WILL MEET IN MEXICO CITY IN 1960

The next Pan American Medical Association Congress will meet in Mexico City, May 2 to 11, 1960, it was announced today by Joseph J. Eller, M.D. Director General of the Pan American Medical Association at the Association's Executive Offices at 745 Fifth Avenue, New York City.

Dr. Eller said that early indications point to the largest and most significant Congress in the 34-year-old organization's history.

He explained that the scientific program, through its 48 different medical sections, will include all branches of medicine and surgery, dentistry, hospital administration, and medical education.

New sections added since the last Pan American Medical Association Congress include SPACE MEDICINE, HEMATOLOGY, CANCER CYTOLOGY, and a large section on GENERAL PRACTICE. There will be many special panels, including *Pharmacology and New Drugs, Mental Diseases, Nutrition, Relationship of Dentistry to Medicine, Cancer Research, Sudden Deaths,* and *Medical Press Relations* and others.

The Congress will also have scientific and commercial exhibits, medical motion pictures, and closed circuit television demonstrations of new techniques. Tours will be arranged to the various medical institutions by the Mexican Chapter of PAMA.

His Excellency, Dr. Jose Alvarez Amezquita, Minister of Health for Mexico, has informed the Pan American Medical Association that he will extend a personal invitation to the Ministers of Health of all the other American nations to attend the Congress as guests of the Mexican government. Special attractions are being arranged for the social portion of the Congress with the cooperation of the Director of Tourism, Alfonso Garcia Gonzalez.

The Pan American Medical Association was organized in New York 34 years ago by a group of eminent physicians to fulfill the need for interchange of medical knowledge and research in the Western Hemisphere. They adopted as their credo: "The practice of medicine has no national, racial, or religious boundaries."

The work of the organization has been cited many times for its program of good will and its contribution to improved medicine through its inter-American Congresses, seminars, and its postgraduate scholarship program.

As Dr. Eller states: "It has been recognized that the work of PAMA has furthered better understanding and good will among the doctors, peoples, and governments in the Western Hemisphere. Indeed, we have been called 'Medical Ambassadors of Good Will.'"

The organization has always adhered firmly to its policy of remaining free of political involvement and has been received with enthusiasm in every American nation.

BIBLIOGRAPHY SERVICE

Medical Group, The Royal Photographic Society of Great Britain

Original papers on photographic techniques and on photographic applications in the medical and biological sciences are published in a very large number of journals. It is, therefore, difficult to use the existing literature for the solution of both theoretical and practical problems.

A bibliography has now been established which consists of punch cards, each of which carries an abstract of an original article. Almost four hundred new cards are added annually to the existing total of well over two thousand such classified abstracts.

The cards are grouped under "Kinematography", "Photography", "Administration" and "Microscopy", before they are subdivided further.

The Hon. Librarian is therefore able to quote the references of papers which have a bearing on any problem concerned with photography in medicine or biology.

The service is extended, free of charge, to all bona fide enquirers. Detailed requests for references to the literature should be addressed to:

J. A. Fairfax-Fozzard, M.A., F.R.P.S.,
The School of Anatomy,
The University, Cambridge, Great Britain.

BOOK REVIEWS

BIOLOGICAL LABORATORY DATA, *L. J. Hale, John Wiley & Sons, (New York), X+132 pages, 1959. $2.75.*

A convenient source of numerical information is useful and may save one much time. This collection includes under mathematical data: tables of logarithms, natural logs, sines, tangents, squares, reciprocals, factorials; formulae for lengths, areas, and volumes, equations, series, differentials and integrals; weights and measures show the inter-relations of measures of length, area, volume, weight, angle conversion and temperature. Statistical data give various distributions and tables of t, , and F and formulae. Various physical-chemical data are provided on density, elasticity, surface tension, osmotic pressure, drying agents, buffers, indicators, refractive indices, resistivity, resister color code, microscope resolution, etc. Saline and culture media include artificial sea water, common solutions, and gas solubility in water. Histological data for narcotizing agents, injection masses, fixing fluids, mounting media, vital dyes, staining and histochemical methods are given. Miscellaneous includes: drill and wire gauges, symbols for correcting proof and photographic data. The latter are brief data on British films, developers, exposure indices and safelights. This is a British book, but most of the data are international and are useful to the biophotographer, mainly for information other than on photography as the photographer will usually have assembled his own material in his own field. No set of tables has ever satisfied everyone. If you use these data this is a convenient form to have them for use. — O.W.R.

ARTIFICIAL LIGHT AND PHOTOGRAPHY, *G. D. Rieck, and L. H. Verbeek, Philips Technical Library, Netherlands, 326 pages (1952), illustrated, 6¾ in. by 10¾ in., price unknown.*

A remarkably comprehensive treatise dealing with the use of artificial light in photography. This book is written on a professional level and contains chapters on Light and Lighting, Photography and Artificial Light, Light Sources, Applications of Filament And Gas-Discharge Lamps, The Uses of Flash Bulbs, Sources of Artificial Light in Projection, Reproduction and Processing, and Special Applications of Artificial Lighting. These eight chapters are divided into subheadings for easy reference and goes into the construction of light sources and the electro-technology one should know in order to intelligently construct and maintain studio lighting equipment. The specific sources used here are mostly of foreign manufacture, but can be substituted for by American sources. Light sources for black and white, color, ultraviolet, and infra-red photography are covered thoroughly so that it is easy to understand why certain sources are needed for these special uses. There are forty-one full page illustrations done by well-known photographers, beautifully reproduced in color and black and white. The technical data for each illustration appears on the last few pages. Many charts and diagrams illustrate clearly the characteristics of almost any type of light used in artificial light photography — a book not only for the bookshelf, but also for ready reference in the studio.

R.B.

SOUTH AFRICAN ANIMAL ANTHOLOGY AVAILABLE

[illegible] be equally delighted with the new 48-page illustrated booklet. An Alphabet of Ani[illegible] *[illegible] by the South African Railways. [illegible] prevent the destruction of whole species of African wildlife by the only foe from whom they had no protection — man.*

Forty-five native animals which the tourist to the Union of South Africa can readily see today are represented by photographs and by the illustrations of Bernard Sargent. All the animal alphabet — from antelope to zebra — is there, with vivid commentaries on their histories, habitats and ways of life.

Seventy years ago South Africa was a wide open hunting ground for anyone with the price

of a rifle and a pair of boots. By the end of the Nineteenth Century, the magnificent black-maned Cape Lion, the Quagga (a graceful cousin of the horse) and the beautiful Blue Antelope had literally been shot from the face of the earth, mostly for man's pleasure.

In 1898 President Paul Kruger of the Trans-

great wildlife refuge. The Board is empowered, when it deems that any species is in danger of extinction, virtually to give the animals the land under their feet to insure their

named for President Kruger — in addition to

reserves head the list of South Africa's tourist

along the roadsides these days, confident that

and varied fun population.

the game reserves and their approaches, tions along with data on camping facilities and

New York 22, N.Y.

by the South African Tourist Corporation to all those interested in animals or travel. The vervet is a wistful-looking but highly cunning creature indigenous to South Africa — one of many species saved from extinction by the establishment of game reserves throughout the country. Bernard Sargent, who hails from

NEW REVISED POCKET PHOTO GUIDE EDITION PUBLISHED

and up-to-date edition of POCKET PHOTO

Modestly priced at one dollar, this convenient manual is jam-packed with a wealth of

For quick, easy reference, essential informa-tion on film, filters, flash, exposure, etc.,

Association News

A section of the Journal devoted to official announcements, chapter events, and other matters of historical significance to the Association.

MERVIN W. LA RUE OF MERVIN W. LA RUE, INC., RECEIVES "AWARD OF MERIT" PLAQUE

Mr. Mervin W. LaRue, one of America's leading producers in the field of visual instruction and medical films, was a guest of honor at a luncheon today (July 15) at the Merchants and Manufacturers Club, Merchandise Mart, Chicago, Illinois. Mr. LaRue received an Award of Merit plaque from the Geo. W. Colburn Laboratory in recognition of years of continued quality film making. The Award read as follows:

"In recognition of his outstanding and meritorious services to the 16mm motion picture industry.

"For over 2 decades he has established a consistent standard of excellence in the production of 16mm Medical Motion Pictures. His efforts have contributed greatly to the application of motion pictures for medical research and training."

In presenting the award to Mr. LaRue, the Geo. W. Colburn Laboratory expressed the warm affection they feel for Mervin who is considered one of the company's oldest and most dearest friends.

Mr. LaRue is a true pioneer in the field of motion pictures having begun his career in 1916 when the industry was still in its infancy. Over the years he has been associated with Underwood & Underwood, Pathescope, Bell & Howell, Burton Holmes and Jack Eaton. The increasing interest and advantages of motion pictures in the medical field resulted in his decision to begin freelancing in 1936. His small company continued to expand until it became a corporation in 1947.

Today Mervin W. LaRue is widely acclaimed and recognized for his development and adaptation of film techniques to research and medical science.

Congratulations, Merv.

Medical Illustrator and Photographer Salary range is $381 to $464 per month. Take and process photographs of tissue specimens and of gross organs. Prepare color slides. Draw medical illustrations. Must be trained in medical art and photography. Write to Department of Personnel, City of St. Louis, 235 Municipal Courts Bldg., St. Louis 3, Missouri

New Products

SLIDE-RULE CARD COMPUTES EXTENSION TUBE DATA

[illegible] all necessary data for the proper use of extension tubes with the Bolex "H" cameras.

[illegible] indicator windows of the slide-rule card [illegible] ce of the field to be photographed, for in[illegible]stance—the computer automatically indicates the extension tube and lens combination to [illegible] stance, the increase in f/stop, depth of field, etc.

Here is how the card is operated:

First, either the desired picture—object ratio [illegible]

Since the use of extension tubes necessitates [illegible] the slide-rule card indicates what the f stop[illegible] mbination being used.

Perhaps the most difficult factor to determine [illegible] theoretically when using an extension tube [illegible] the depth of field. Without the calculator [illegible]

NEW LINHOF ROLLFILM HOLDERS ELIMINATE FILM WASTE

[illegible] still continue to be the most popular print sizes, West Germany's Linhof Precision Camera Works now makes new rollfilm holders to take 2¼ exposures 2¼ x 2¾" on No. 120 film. The new Super hollex holders have just been introduced to the U.S. market by Klina Photo Corporation, New York, N.Y., Linhof's exclusive distributor.

[illegible] Super hollex holders enlarges to all standard sizes without loss of film area or need of cropping [illegible] savings in film cost compared to the 2¼x3¼ size.

[illegible] ances the film and automatically sets the exposure counter. The fast lever action [illegible]

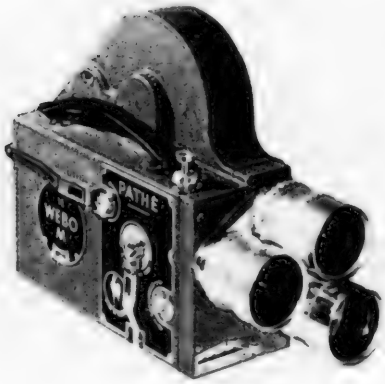
[illegible] revolving back for Linhof 2¼x3¼ camera[illegible] and as a rollfilm holder to fit the Universa[illegible]

The all-metal Super hollex ma[illegible]

PATHE INTRODUCES NEW 16mm CONTINUOUS REFLEX CINE CAMERA!!

Camera Technicians at E[illegible] newly appointed USA Pathe [illegible] that the new Pathe model "Webo-M" possesses the same performance ability and accurate control system of its higher priced prote[illegible] sister model . . . yet is much lighter and more compact.

It features a continuous REFLEX FINDER SYSTEM -- behind the lens -- that permits sighting through the shooting lens without loss of brilliance, even when the VARIABLE SHUT



framing WITHOUT PARALLAX and exact focusing for macro and macrocinematography, wide-angle, tele-photo, etc.

frames per second; and the VARIABLE SHUTTER ... fades and special effects possibilities (a sound signal is given when shutter is totally closed). The Viewfinder magnifies reflected image more than eight times.

This camera takes all 16mm standard C mount lenses without the expense of additional viewfinder. Other features include: Film and ... (backward or forward), Five-Way Release, ... Lens Turret Head.

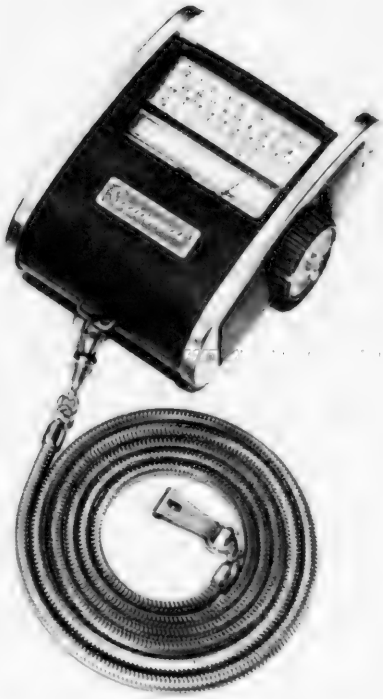
A list of accessories including compendium and macro, motor drive, special lenses, etc., and prices may be had by writing:

BURKE & JAMES, INC., USA Distributor,
321 S. Wabash Ave., Chicago 4, Illinois

GOSSEN SIXTOMAT-X2 METER INDICATES EXPOSURES UP TO 5½ MINUTES

... accuracy, and built-in convertibility from reflected to incident light measurement are some of the features of the handsomely styled Gossen Sixtomat-X2 exposure meter for still and movie cameras just introduced by Klima Photo Corporation, New York, sole U.S. distributor ... the Gossen Company of West Germany.

The Sixtomat-X2 has an extremely respon-



... with a free-swinging indicator needle that ... means of the exclusive Gossen "triple ... hair" system. Exposures for lens opening ... from f/1.5 to f/... are indicated simultaneously in standard shutter speeds, new ASA ... progression speeds from 1/1000 second to 4 minutes, and EV scale from 0.5 to 19.5. The 15 Exposure Value calibration also serves for an extreme time exposure indication of 5 minutes. Motion picture camera speeds of 8, ... conveniently obtained. All film ...

The anti-reflection coated high-transmission honeycomb lens of the Sixtomat-X2 can instantly be converted for incident light measurement with the Gossen-exclusive "rollo" diffusion screen which also acts as "case" for the meter when fully closed.

Despite its high sensitivity, the Sixtomat-X measures only 3x2x1.¾" and weighs just

ounces. Its compact, streamlined body is finished in muted charcoal gray with white and satin chrome trim.

The Sixtomat-X2, complete with 34½-inch chrome neck chain and attractive clear plastic gift box is sold through camera stores, at $19.95.

For additional information write to Kling Photo Corporation, 257 Park Avenue South, New York 10, N.Y.

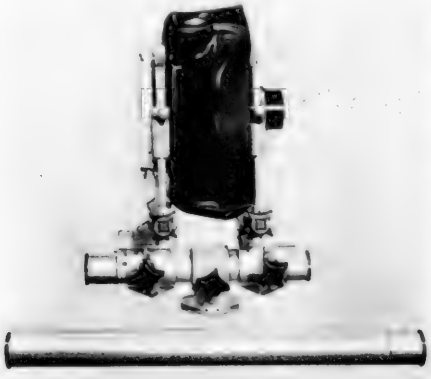
SINAR OPTICAL SPLIT-BENCH FOR WIDE ANGLE WORK

The SINAR Interchangeable (8x10 — 5x7 — 4x5 — 2¼x3¼ — 2¼x2¼") Swiss view camera is now supplied with an 18" optical split-bench (consisting of 2 sections of 6" and 12") which facilitate unhampered wide angle photography.

In combination with the 18" bench extension, the following lengths are available: 6", 12", 18", 24", 30", 36" and longer by adding additional tubes.

All SINAR optical benches can be easily screwed together without joints and without removing the camera. A ruler (calibrated in inches and mm) and a pin suitable for both the SINAR filterholder and bellows support are conveniently located inside the bench tube. They are included in the price of all SINAR Expert cameras.

Distributed in the U.S. by Karl HEITZ, Inc., [illegible] through franchised SINAR dealers, the split-bench tube is part of all SINAR cameras, which retail from $349.00 and up.



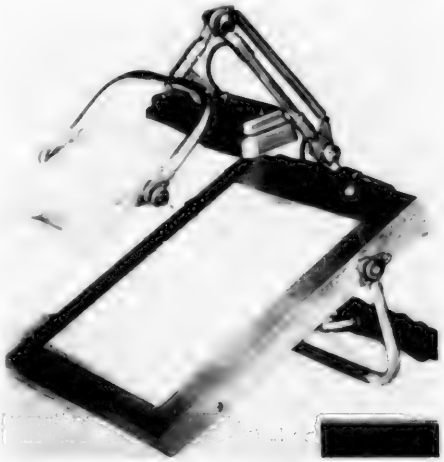
NEW FILMS DATA BOOKLET ANNOUNCED BY DU PONT

LOS ANGELES, July 25 — A new edition of "Du Pont Photographic Films," generously illustrated with photographs, diagrams, and handy charts, was announced by the Du Pont Photo Products Department, Wilmington, Del.

Prepared in an 8½ x 11-inch format to permit greater flexibility in typographic [illegible] layout, the 40-page booklet contains considerable information on fundamentals of photography. It includes sections on film selection, lighting, exposure, sensitometry, and technical data on each of Du Pont's many "Cronar" polyester photographic sheet films, for portrait, industrial, commercial, and news application.

A helpful chart on the "Cause, Prevention and Cure of Common Negative Defects" is included, as well as non-proprietary formulas for Du Pont film developers, replenishers, fixers, intensifiers, and reducers.

The Du Pont Photographic Films data booklet was produced with the editorial assistance of Henry M. Lester. It is available through authorized Du Pont dealers at 75 cents per copy.



MULTI-PURPOSE MAGNIFIER ILLUMINATOR VIEWING TABLE (PORTABLE

[illegible]

An 8½" x 11" viewing table in combination with [illegible] lens and independently controlled overhead fluorescent lighting (110 Volt AC).

The viewing table base is approximately 13" x 15" x 1¾". The underlighting is provided by two recessed 8W fluorescent lamps.

The magnifying lens is of the finest quality optically ground acrylic plastic with a high resolution factor. Eliminates eyestrain and the need for rigid posture that causes unusual fatigue when using smaller and undersized magnifiers.

The overhead lighting is two 4W fluorescent tubes. This light source is independently switched to use either underlighting, overhead or both together.

The angle of incident of the overhead lighting may be changed at will without changing the lens position, a feature not found in most equipment.

The supporting arms and lens yoke are tubular steel with adjustable friction disc joints spring balanced for smooth easy lens adjustment. The adjusting nuts are large knurled nuts in bright chrome finish.

The price is $59.50 each net without lamps.

NEW ALPA 180mm LENS WITH FULLY AUTOMATIC DIAPHRAGM

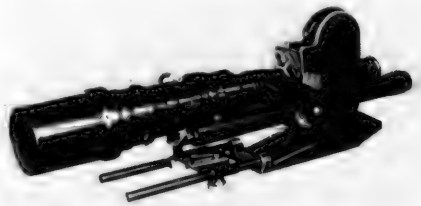
The ALPA Alitar 180mm f/4.5 for the Swiss ALPA 35 mm Single-lens Reflex camera combines the features of a true telephoto lens (13° angle) with outstanding correction at full aperture in a 5-element, fully automatic diaphragm lens, ideally suited to wildlife, sports and nature photography.

Conveniently located on top of the lens mount — independent of the distance setting the automatic diaphragm permits easy composition and focus at full aperture. As the shutter is tripped, the diaphragm closes automatically to the preselected f/stop and reopens AUTOMATICALLY [illegible] instantly thereafter. The Automatic diaphragm may be disconnected for viewing the depth-of-field.

Focusing range extends from infinity to 8 ft. and the lens accepts the standard, coated slip-in ALPA glass filters and reversible lens-hood.

Each ALPA Alitar is twice individually tested — by the lens manufacturer and again at the ALPA factory — for snug fit, correct focus, overall illumination, contrast and resisting power and carries an unconditional guarantee for highest optical performance.

Distributed in the U.S. by Karl HEITZ, Inc., 480 Lexington Avenue, New York 17, N.Y. through franchised ALPA dealers, the ALPA Alitar 180mm f/4.5 retails for $169.00.



KINOFLEX REFLEX HOUSING

A new addition to the KINOPTIK line of [illegible] is the KINOFLEX Reflex Housing.

Designed to work with lenses of 210mm and longer focal lengths, the housing fits between camera and lens, replacing an equal section of the lens mount. Within the housing a movable prism is used for parallax-free focusing and framing the image and then removed to the viewfinder to allow 100% of the light transmitted to reach the film. The viewfinder part is then used to frame and follow the subject. The Kinoflex Reflex Housing is available in C, Cine-Special, Arriflex, Eyemo, Camerflex and other mounts.

For the prevention of undue strain on the camera when used with the long focal lenses and reflex housing, the use of the KINOPTIK cradle support is recommended.

Distributed in the U.S. exclusively by Karl HEITZ, Inc., 480 Lexington Avenue, New York 17, N.Y., through franchised KINOPTIK dealers, the KINOFLEX Reflex Housing sells for $299.00, the cradle support for $99.

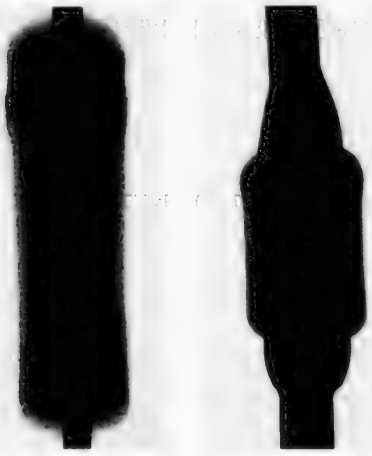
FILTER TECHNIQUE AIDS TAKING OF X-RAY PHOTOMICROGRAPHS

A filter technique to aid the taking of sharp photographs with an X-ray microscope was announced by Chicago Apparatus Company, laboratory equipment supplier.

An X-ray photomicrograph will make possible the non-destructive inspection of miniature electronic components such as resistors, crystal diodes, photoresistors, ceramic capacitors, transistors, thermistors, and other encapsulated parts.

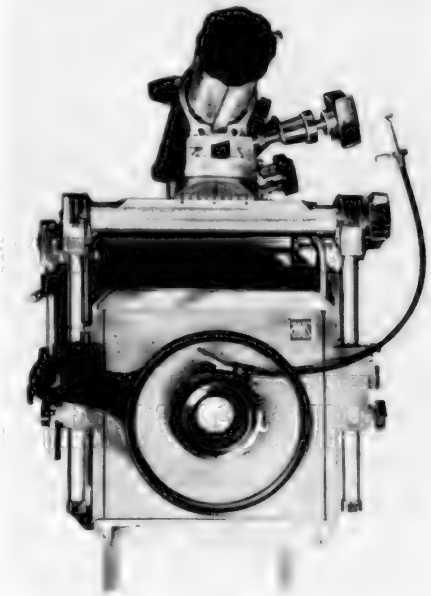
The time required for such photographs using the Polaroid Land camera supplied with a General Electric X-ray microscope, is from 5 to 10 minutes, the company said. Magnifications up to 200X are possible, permitting the inspection of fine detail such as micro welds. Dimensions of internal features can be computed in proportion to the enlargement of measurable exterior features.

Chicago Apparatus Company developed certain filter techniques for X-ray photography. The company was the first in the laboratory field to be appointed a distributor of the GE X-ray microscope.



X-RAY PHOTOMICROGRAPHS SHOW INTERNAL STRUCTURE OF MINIATURE COMPONENTS

These photographs were copied from original X-ray photomicrographs made with a G E X-ray microscope and a Polaroid Land camera. At the left is a 5.5X photomicrograph of a .NAA [illegible] clearly the details of the internal construction. At the right is a 5.5X enlargement of a ¼ watt carbon resistor in which the embedded leads and core are clearly visible. Chicago Apparatus Company, laboratory equipment supplier, says its new filter technique for the taking of such pictures will pave the way for non-destructive inspection of many miniature components.



NEW SINAR UNIVERSAL FILTER HOLDER

This unique filter holder allows the use of just ONE set of filters for all formats of the Swiss SINAR, interchangeable View camera 8x10" - 5x7" - 4x5" - 2¼x3¼" - 2¼x2¼"

The holder is fastened to the front frame of the SINAR camera by a metal stud and can be swung in and out of position while exchanging lens boards or adjusting the lens.

It accepts the 103 diameter coated SINAR filters, precision ground of finest optical glass dyed in the mass. Adapters for series VIII and IX filters are available as well.

Distributed in the U.S. exclusively by Karl HEITZ, Inc., 480 Lexington Avenue, New York 17, N.Y., through franchised SINAR dealers the Universal Filter holder retails for $25.9[illegible]

CONTRIBUTING MEMBERS

Dean C. Altman
A. Andreeko
Anonymous
Dr. Spencer Atkinson
William Atkinson
Harold C. Baitz
Dr. Edgar C. Baker
E. Lynn Baldwin
Donald L. Bechard
Tibor Benedek, M.D.
Lester V. Bergman
Keturah D. Blakely
Leland Bowerman
Laurence B. Brown
Robert A. Brown
Charles G. Brownell
M. Bigelow Browning, M.D.
Joseph D. Brubaker
Dr. Ralph Buchsbaum
Perry Burgess, Jr.
William J. Cameron
Lardner Coffey
Philip A. Conrath
Howard Cradick
Joseph R. Dant
Capt. Stephen P. Dittmann
P. K. Duraiswami, M.D.
C. Graham Eddy
Edward Entin
Louis A. Facto
Dr. E. J. Farris
Jack Fason
Prof. Deam H. Ferris
Louis Paul Flory
A. Wilson Footer, M.D.
Jay T. Fox
H. Lou Gibson
Luther R. Gilliam
D. M. Glover, M.D.
Leo Goodman
F. W. Goro
Alex A. Gravesen
Avis Gregersen
Richard D. Grill
C. G. de Gutierrez-Mahoney, M.D.
Ferdinand R. Harding
Rudolph J. Henning
Leslie E. Hier
David Hilbrand
Constance Holland
Nathan S. Horton
Joseph T. Jackson
Homer Jones
M. George Jorgenson
Leonard A. Julin
Nathan C. Kantor
John Kozie
T. C. Kramer
Victor R. Landi
John M. Langton, M.D.
Thomas J. Lannon
Mervin W. LaRue, Sr.
Pierre J. LeDoux
Henry M. Lester
Albert Levin
K. Cramer Lewis
Gerald M. Lindley
David Lubin
James Mahaffey
Francis C. Mallory
Robert Mallory, III, M.D.
William L. M. Martinsen
Leo C. Massopust, Sr.
Thomas Masterson
Richard G. McClure
Leslie McWilliam
Dr. C. C. Mendenhall
Julius S. Mesiar
Bernard J. Moore, Jr.
Robert M. Moore, Jr.
Robert T. Morrison
Alex V. Mucha
Leonard Perskie
Dorothy M. Pinkham
Arthur Proetz, M.D.
Dr. William Quijano
Richard H. Ray
George W. Reis
Dr. Oscar W. Richards
Bernard Salb
Sidney Shapiro
Anne Shiras
Mrs. Elvira Showstark
Paul J. Showstark
Mose Smith, III, M.D.
William G. Smith, Jr.
H. E. Steadman, M.D.
M. Victor Stokes, II
Warren Sturgis
Joseph W. Tandatnick, M.D.
W. Jackson Taylor
William J. Taylor
Dr. Harvey E. Thorpe
Howard T. Toenniges
Howard E. Tribe
Harris B. Tuttle
Lloyd E. Varden
Dr. Roman Vishniac
Julius Weber
Allen Weinberg
Leonard Winograd
Lloyd A. Wolf
Thomas L. Wood
June Woodworth
Verlin Y. Yamamoto
Stella Zimmer

SUSTAINING MEMBERS

AGFA INCORPORATED
AMERICAN SPEEDLIGHT CORP.
ANSCO
ARKAY CORPORATION
CHARLES BESELER CO.
BRINKMANN INSTRUMENTS, INC.
E. I. du PONT de NEMOURS & CO.
EASTMAN KODAK CO.
ELGEET OPTICAL CO., INC.
EXAKTA CAMERA CO.
W. J. GERMAN, INC.
GRAFLEX, INC.
KARL HEITZ, INC.
KERN CO.
KLING PHOTO SUPPLY CORP.
POLAROID CORPORATION
POSTGRADUATE MEDICINE
J. G. SALTZMAN, INC.
SANDERS LABORATORIES, INC.
SIMMON BROS., INC.
S. O. S CINEMA SUPPLY CORP.
WILLOUGHBYS

FELLOWS of the ASSOCIATION

HAROLD C. BAITZ
JOHN J. BEITER
DR. ARTHUR D. BENSUSAN
PERCY W. BROOKS
LAURENCE B. BROWN
CHARLES G. BROWNELL
JOSEPH D. BRUBAKER
JOHN V. BUTTERFIELD
*JULIAN CARLILE, 5-4-59
LARDNER A. COFFEY
RALPH P. CREER
JANE WATERS CROUCH
J. W. CRUNELLE
CAPT. STEPHEN P. DITTMANN
S. C. DUNTON
C. GRAHAM EDDY
CHARLES E. ENGEL
DR. EDMOND J. FARRIS
LOUIS PAUL FLORY
JAY T. FOX
ARTHUR W. FUCHS
JAY M. GARNER, M.D.
H. LOU GIBSON
ALEX GRAVESEN
AVIS GREGERSEN
JULIUS HALSMAN
ALLEN HANCOCK
DR. PETER HANSELL
FERDINAND R. HARDING
CHARLES P. HODGE
PAUL H. HOLINGER, M.D.
*JOSEPH HOMAN, 3-17-59
NATHAN S. HORTON
MARIA IKENBERG
LEONARD A. JULIN
FRED W. KENT
THOMAS J. LANNON
MERVIN W. LaRUE
PIERRE J. LE DOUX
HENRY M. LESTER
ALBERT LEVIN
CHARLES LINDSAY
ROGER P. LOVELAND
DAVID LUBIN
ADOLPH MARFAING
WILLIAM L. M. MARTINSEN
LEO C. MASSOPUST, SR.
I. I. MATLOVSKY
JOHN A. MAURER
STANLEY J. McCOMB
JOSEPH E. MINEO
HENRY M. MORRIS
DR. ROBERT OLLERENSHAW
WILLIAM F. PAYNE
LEONARD L. PERSKIE
DR. ARTHUR W. PROETZ
CHESTER P. REATHER
DR. OSCAR W. RICHARDS
MAURICE N. RICHTER, M.D.
HENRY ROGER
DR. GEORGE L. ROYER
ROBERT A. SAGE
SIDNEY SHAPIRO
ANNE SHIRAS
WILLIAM STEVENSON
WARREN STURGIS
WILLIAM J. TAYLOR
HOWARD E. TRIBE
HARRIS B. TUTTLE
LLOYD E. VARDEN
ROMAN VISHNIAC
JULIUS WEBER
JOHN E. WITHEE
VERLIN Y. YAMAMOTO
H. WOLFGANG ZIELER
STELLA ZIMMER

*deceased.

FELLOWSHIP PROCEDURE

Members may propose for Fellowship in the BPA other members whom they consider worthy of recognition. To be eligible for Fellowship a candidate must have been a member of the Association for five consecutive years and must possess one or more of the following qualifications:

Superior craftsmanship in still or motion picture photography of biological subjects.

Ability in photographic research in new methods or materials.

(These require submission of evidence.)

Meritorious contributions to biological photography overall through sustained organizational work.

Two sponsors are required. The sponsors should be well acquainted with the candidate's work and ready to furnish the Board with details of his experience and achievements. Those who wish to sponsor a member whom they believe to be eligible should request a Fellowship Application form from the Secretary of the Fellowship Committee: Mrs. Maria Ikenberg, University of Illinois, 904 W. Adams Street, Chicago 7, Illinois.

CONTENTS

JOURNAL OF THE BIOLOGICAL PHOTOGRAPHIC ASSOCIATION

Volume 27, Number 3 — August, 1959

LAYOUTS FOR MEDICAL PHOTOGRAPHY . . . H. Lou Gibson 93

MEDICAL AND BIOLOGICAL ILLUSTRATION 112

SMOOTH TRANSITION TECHNIQUES IN 16MM. FILM EDITING . . . . . Herbert A. Fischler, B.S., M.A. 113

LOW POWER STEREOSCOPIC PHOTOMICROGRAPHY . . . . . Phillip H. Mott 119

BOOK REVIEWS 124

ASSOCIATION NEWS 126

NEW PRODUCTS 127

CONTRIBUTING MEMBERS 132

SUSTAINING MEMBERS, FELLOWS OF THE ASSOCIATION, FELLOWSHIP PROCEDURE . . . . . Inside Back Cover

PRINTING BY HAMMERSMITH-KORTMEYER COMPANY, MILWAUKEE, WISCONSIN

4

JOURNAL OF THE

Biological Photographic Association

Dedicated to the Science, Techniques and Applications Pertaining to the Photography of All Things Which Live or Which Have Lived

QUARTERLY OF THE BIOLOGICAL PHOTOGRAPHIC ASSOCIATION, INC.

Volume 27, Number 4 November 1959

JOURNAL *of the* BIOLOGICAL PHOTOGRAPHIC ASSOCIATION

EDITOR

EDITOR . . . . . LEO C. MASSOPUST

ASSOC. EDITOR . . . . . STANLEY WEINREB, Ph.D.

Marquette University
School of Medicine

Milwaukee 3, Wisconsin

EDITORIAL POLICY

Manuscripts should be sent to the Editor in legible form on 8½" x 11" paper, preferably typewritten, double spaced, with 1¼" margins on both edges as well as top and bottom.

Tables should be on separate sheets, each with self explanatory captions.

Reference notations in the text should be written as superscripts. Do not place in parenthesis. References should be on sheets separate from the text, numbered consecutively in the order of their appearance in the manuscript. Journal references should include: Author(s), title of article, volume number, page number(s), month and year. Book references: Author(s), title of book, edition, page number(s), publisher, year. Double space lines, triple space between references, 1¼" margins.

Illustrations should accompany the manuscript, preferably unmounted. They must not be larger than 14" nor smaller than 4" in maximum dimension, and should be properly proportioned to fit single column, double column or full page of the Journal. Identify each illustration on its back in soft blue pencil, giving title of paper, senior author and Fig. No. only. Legends should be on a separate sheet and each identified by Fig. No. matching its illustration. Double space lines, triple space between legends, 1¼" margins.

The editors reserve the right to reject manuscripts considered unsuitable. Major alterations of accepted manuscripts will not be made without permission of the senior author.

Special Note: If you have an idea or technique of importance to biological photography and need assistance in preparing the manuscript, write Editor.

OFFICERS OF THE ASSOCIATION

President — Leo C. Massopust, Sr., FBPA, Marquette University School of Medicine, Milwaukee, Wis.

Vice President — Verlin Y. Yamamoto, FBPA, Medical Illustration Service, Veterans Administration Center, Des Moines 9, Iowa

Secretary — Mrs. Jane W. Crouch, FBPA, Grand Central P.O. Box No. 1668, New York 17, N.Y.

Treasurer — Albert Levin, FBPA, University of Pittsburgh Medical Illustration Lab. 1016 H.P.B., Pittsburgh 13, Pa.

Opinions expressed by authors are not necessarily those of the Biological Photographic Association.
Copyright, 1960, by Biological Photographic Association, Inc.

OFFICIAL PUBLICATION OF THE BIOLOGICAL PHOTOGRAPHIC ASSOCIATION, INC.

Published at 733 North Van Buren Street, Milwaukee 2, Wisconsin. Editorial office: Box 1668 Grand Central P.O., New York 17, N.Y. Entered at the Post Office, Milwaukee, Wisconsin, under the act of March 3, 1879. Subscription price $9.00 per volume; foreign $9.50. Single copies $2.25 in the U.S.A.; foreign $2.40 in U.S.A. funds.

Journal of the Biological Photographic Association Vol. 27, No. 4 November, 1959

Photographing Precipitation Bands In Agar Gel Plates

ROSS JACKSON

bio-Graphic unit, Scientific Information, Research Branch, Canada Agriculture, Ottawa.

THE photographic recording of precipitation bands in agar gel plates has presented problems because the definition required in the reproduction of the band patterns is extremely difficult to achieve. The method by which the bands are formed will be disregarded: it will suffice to say that they are produced by the antibodies from the serum wells and the soluble antigens from the antigen wells diffusing toward each other and reacting to produce thin "white" precipitation lines of varying density and width. In this case the reactions were studied in 100 X 15 mm Petri dishes containing about 18 ml. of agar with two central serum wells and six antigen wells.

Lawson[1] has described a procedure whereby very good results can be obtained using a single tungsten source, the light from which is "bounced" from black velvet and reflected to white cards. The only objections to this are the necessarily long exposures, and the problem of heat which may affect the plates. Shutz[2] has developed a complex device for both viewing and photographing diffusion plates which gives good results, but this is rather elaborate for the worker requiring this type of photography only infrequently.

This paper outlines a series of relatively simple tests which were conducted with standard photographic equipment. These tests were necessary to determine the combination of factors which would produce photographs suitable for analysis.

The illumination techniques used were: straight reflected light with the Petri dish placed directly on black velvet (electronic flash was used for all exposures), and transmitted illumination using bounce light from two white cards, with either black velvet or a white card as background. The background was dropped well below the Petri dish which was supported by glass (Fig. 1). Two shields were used to prevent light entering the lens or directly illuminating the

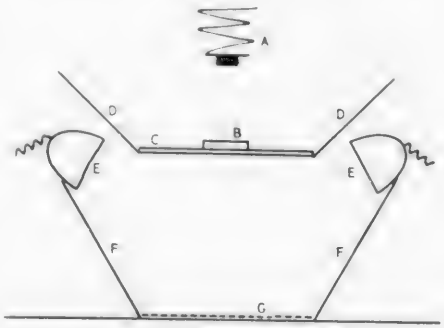
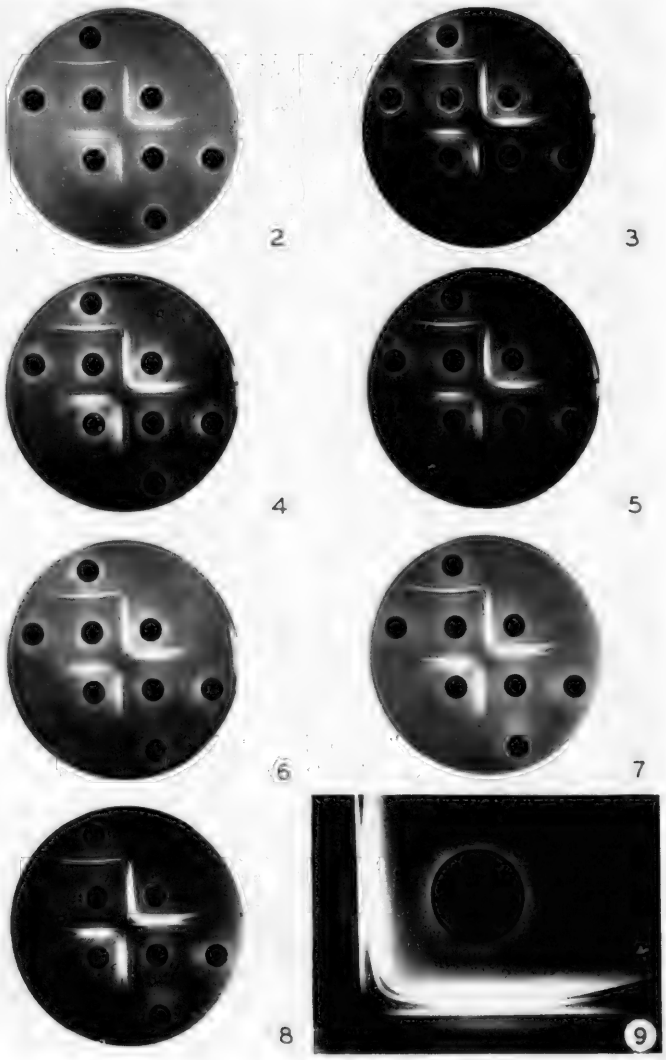


Figure 1



Figures 2-9

plate. Naturally, diffused light from reflectors provided a much more even result than light directly transmitted.

Plates stained with Orange G and Alcian Blue were compared with unstained ones. Orange G stains the proteins and concentrates in the precipitation bands; filtration was used to transmit these bands. Alcian Blue stains the carbohydrates of the agar gel; here filtration was used to lose the background.

Wilson[3] flooded specially constructed plexiglas plates with 10 ml. of distilled water containing .006% Orange G just before making his photographs by placing the plates on lantern slides and ex

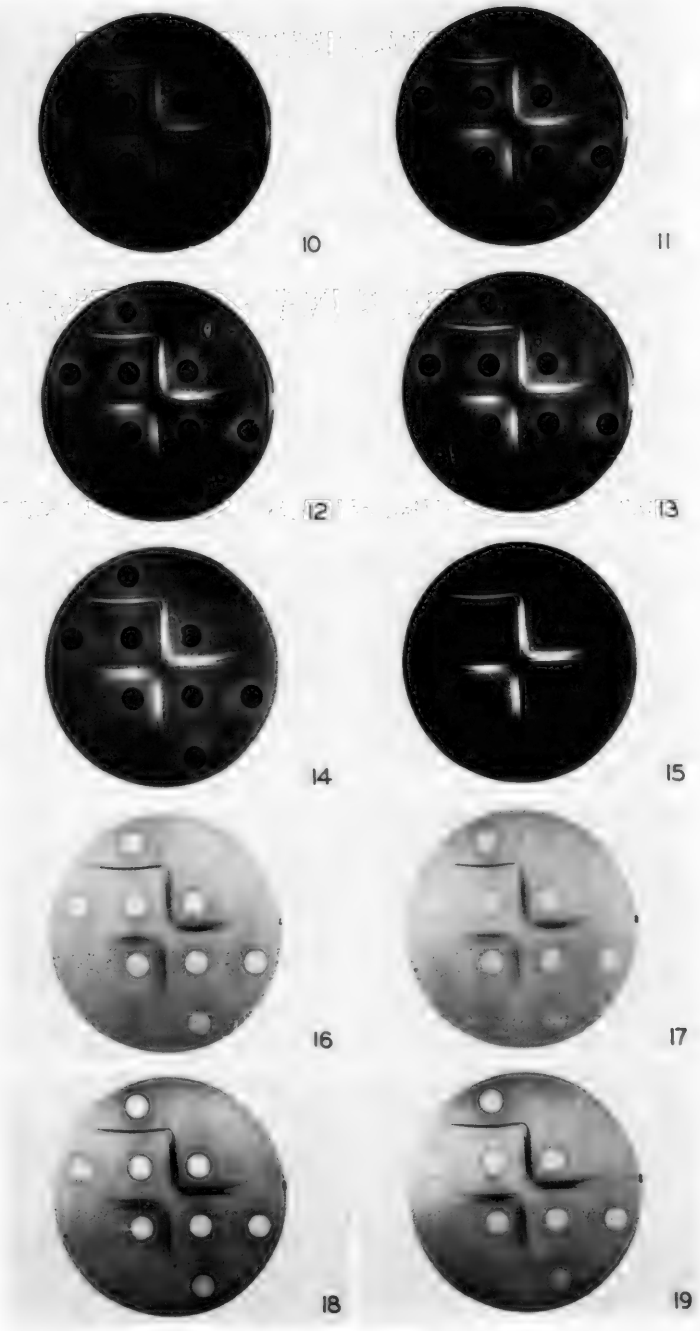
posing by means of an enlarger.

The plate used for figures 2 to 8 was unstained, that used for figures 10 to 19 was stained with Orange G (same concentration as above), for one hour then washed with tap water, to remove the serum and antigen from the wells, and flooded with 20% methanol in physiological saline to fix the proteins. The one used for figures 20 to 27 was stained with a dilute solution of Alcian Blue for about five minutes and then treated as above. The photographs were taken with the methanol still on the plates as this eliminated reflections from the edges of the wells. The same flooding treatment was given for figures 2 to 8, which was the same plate as used for the Orange G set, before staining of course.

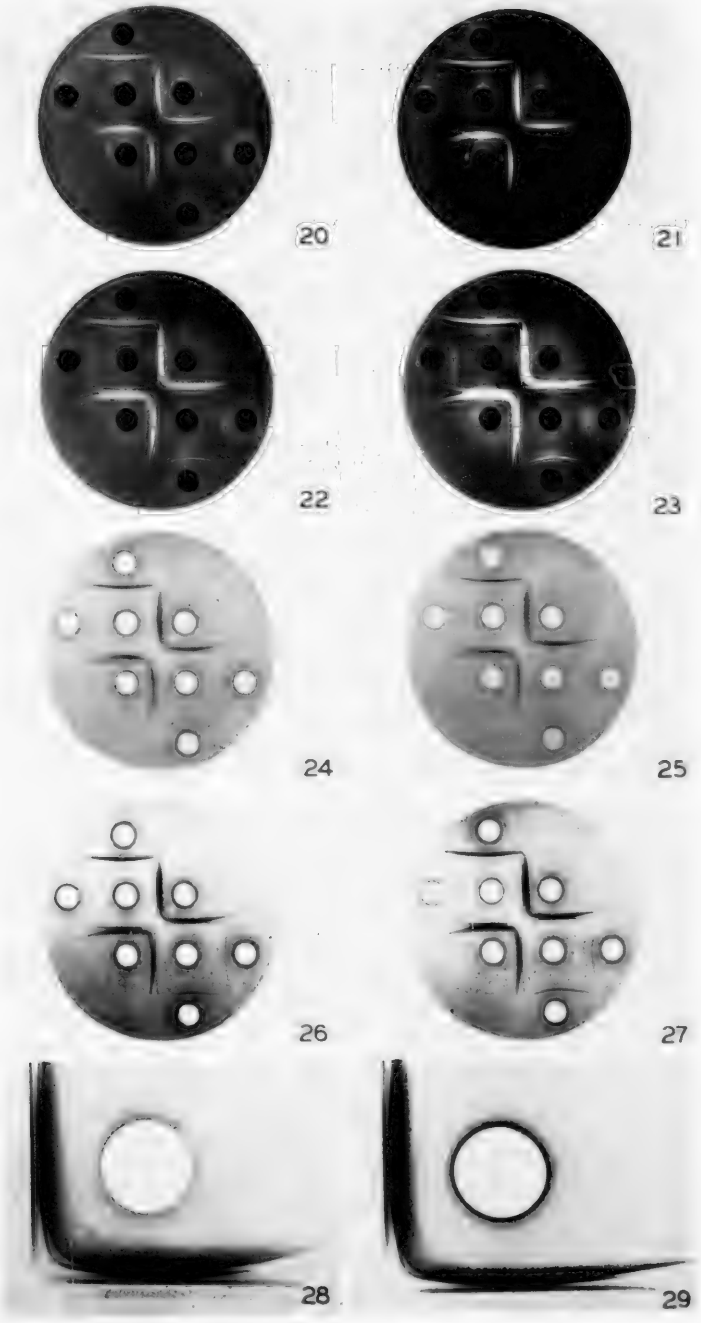
The film combinations which were used are listed in Table 1. Panatomic-X was used as a control for "normal" rendering of the plate in each set. Contrast Process Ortho (C.P.O.) and Contrast

STAIN	TECHNIQUE	FILM	FILTER	f	DEV.	FIG. NO.
NONE	REFLECTED (BLACK)	PAN X	NONE	22	D-76, 11 min.	2
		C.P.O.	"	32	D-76, 11	3
		C.P.O.	"	32	D-11, 4	4
		C.P.P.	"	32	D-76, 11	5
		C.P.P.	"	32	D-11, 4	6
	TRANSMITTED (BLACK)	PAN X	NONE	11	D-76, 11	7
		C.P.P.	"	16	"	8
ORANGE G	REFLECTED (BLACK)	PAN X	NONE	22	D-76, 11	10
		PAN X	#25	8	"	11
		C.P.P.	NONE	22	"	12
		C.P.P.	#25	11	"	13
	TRANSMITTED (BLACK)	PAN X	#25	8	D-76, 11	14
		C.P.P.	#25	8	"	15
	TRANSMITTED (WHITE)	PAN X	NONE	22	D-76, 11	16
		PAN X	#25	8	"	17
		C.P.P.	NONE	22	"	18
		C.P.P.	#25	11	"	19
ALCIAN BLUE	REFLECTED (BLACK)	PAN X	NONE	16	D-76, 11	20
		C.P.P.	"	11	"	21
	TRANSMITTED (BLACK)	PAN X	NONE	16	D-76, 11	22
		C.P.P.	"	11	"	23
	TRANSMITTED (WHITE)	PAN X	NONE	11	D-76, 11	24
		PAN X	#47	$5.6+\frac{1}{3}$	"	25
		C.P.P.	NONE	16	"	26
		C.P.P.	#47	$5.6+\frac{1}{3}$	"	27

Table 1



Figures 10-19



Figures 20-29

Process Panchromatic (C.P.P.) films were used to gain the contrast required to improve the rendering of the bands. Exposures were made to provide the best processing procedure (Figs. 2 to 6). The recommended developer, Kodak D-11, was used for figures 4 and 6, processing for 4 minutes at 68 F. It was found that although this film-developer combination certainly produced a negative with more contrast, the lines did not seem to be any better defined over the ones which were processed in D-76 for 11 minutes at 68 F. (Figs. 3 and 5). D-76 did not sacrifice the rather subtle grays in the plate. Since no recommended development times are given for these contrast materials in D-76, the processing time of 11 minutes was arrived at by trial. The same holds true for the exposures listed in the table, which include the required filter factors, since no ASA ratings for daylight sources are listed. The filter factors used are those given for "white flame arc". When it was found that a factor in a particular combination was not suitable, a compensation was made in the exposure. No attempt has been made to determine ratings for these materials other than to arrive at exposures under these restricted conditions. Also, it should be stated that the negatives were produced to be evaluated on a densitometer, because some of the more subtle information is naturally lost in transposing to a print.

In the unstained set (Figs. 2 to 8) it was found that figure 3 was the best. This film-developer combination gave the necessary contrast but held the faint grays, which were important, and was better than figure 4 which lacked separation in the heavier areas. C.P.P. did not resolve the lines well, using either developer, with the plates in the unstained condition. Figure 8 (transmitted illumination with black background) was the best of the set; figure 9 is an enlargement (approximately 5X) of a portion of figure 8 showing the separation achieved. The procedure using transmitted light on a white background was not used here due to the lack of original contrast in the plate.

In the second set (Orange G, Figs. 10 to 19), figure 15 is the best. C.P.O. was not used in this series due to its lack of red sensitivity. Figures 16 to 19 show the lines well but not to the same degree as figure 15.

In the final set (Figs. 20 to 27), figures 23 and 27 were considered best. Comparing these with the original plate showed about equal results. Unfortunately these cannot be compared with the other two sets because a new plate had to be prepared for staining with Alcian Blue. Although the same reactants were used the patterns are not identical. Figure 28 is an enlargement of figure 18, and figure 29 an enlargement of figure 27 to show the detail obtained.

It should be noted that those illustrations using the bright field technique, although reversing the result from the usual appearance of the plate, produced a negative which is quite satisfactory. As far as the reading of the negative is concerned, the choice of technique is dependent upon the preference of the interpreter.

ACKNOWLEDGEMENT

Thanks are due to Dr. I. A. Elliott, Head, Bacteriology Section, Dairy Technology, and Mrs. S. Cole for their help and direction in the preparation of this paper

REFERENCES

1. Lawson, D. F., 1957. Photographing Precipitation Bands. *J. Photo. Sci.*, 5:1
2. Schutz, J. N., 1958. Dark Field Illumination for Petri Dish Photography. *J. Bio. Photo. Assn.* 26:159.
3. Wilson, M. W., 1958. Agar Diffusion Precipitation Technique. *J. Immunol.*, 81:517

Journal of the Biological Photographic Association Vol. 27, No. 4 November, 1959

Photographing Insects Close Up

W. P. NYE and G. E. BOHART

Entomology Research Division, Agr. Res. Serv., U.S.D.A.

IN our pollination research we use close-up photographs of insects as a pictorial notebook for keeping accurate and meaningful records. Candid photographs of insects require instruments with great flexibility and precision. A Leica camera with accessories and an electronic flash unit were used to make the photographs presented herein.

When the Leica IIIa, equipped with a Geiss Kontakt synchronization block, is set at 1/30 second, and the electronic flash unit is set for zero delay, the shutter and light are properly timed. An electronic flash has several advantages over flood lamps. It standardizes the light factors; gives plenty of light without "cooking" the subject, and gives a brief enough flash duration to "stop" both camera and subject. The last factor is vital for the many situations in which the camera must be hand-held. Finally, the color temperature of the flash is similar to daylight, thus obviating the need for a filter with daylight color film. Normal outdoor lighting adds but little to the light reflected from the subject during the flash interval. Consequently, the proper distance of the flash lamp from the subject under most lighting conditions can be determined from a single series of tests varying the F-value and the lamp distance. However, when the subject is exposed to bright sunlight reflected from a light background, as well as to strong incident lighting, it is necessary to increase the flash lamp distance over that determined from tests made under ordinary lighting conditions.

For still subjects a Leica used with Focaslide, extension tubes, and 50 or 90 mm. Elmar lens works well, but for candid shots of insects in motion, it is better to have the camera equipped with Visoflex, 135 mm. Hektor lens, and bellowscope. A 5X wide field magnifier, used over the ground glass of a Focaslide or Visoflex, makes the critical focusing necessary for insect subjects relatively easy. With these accessories, the color transparencies or monochrome negative shows exactly what is framed on the ground glass. When using the Focaslide, the lens aperture is opened wide for focusing and stopped down just before the picture is taken. With the Visoflex, focusing is done with the lens stopped down to f/16. Preset diaphragm lenses are now available for use on the Visoflex. They increase the versatility of the equipment for close-up work.

A Leica III-f with Visoflex, 90 mm. lens set at f/16, and Heiland Strobonar 71A electronic flash was used to photograph free-hand the accompanying

FOOTNOTES

1 Accepted for publication Nov. 2, 1959. The use of trade names in this paper does not imply the U.S. Department of Agriculture's endorsement of the equipment mentioned.

2 In cooperation with the Utah Agricultural Experiment Station.

sequence on the emergence of a bee fly. The Heiland Strobonar 71A lamp was mounted on a special bracket on the left side of the camera. The camera was hand-held for the entire series of pictures. Actually, a tripod can only rarely be used for taking photographs of active insects in the field. All photographs in this series, except figure 10, were taken on Adox film, KB14. Figure 10 was taken on Kodak Plus X film with the lens stopped down to f/22.

EMERGENCE OF A BEE FLY

In June the bee fly, *Heterostylum robustum* (O.S.), a serious parasite of the alkali bee, transforms from a larva to a pupa and drills its way to the surface of the ground

Figure 1. It breaks the crust and retreats a few minutes before the final push.

Figure 2. Head and shoulders push out of the ground. Note the circlet of drill bits on its head.)

Figure 3. When the pupa is half exposed, the adult fly splits the pupal case down the back.

Figure 4. The adult fly thrusts higher.

Figure 5. And higher.

Figure 6. And back.

Figure 7. Oops!

Figure 8. Free at last.

Figure 9. Now to dry its wings for action.

Figue 10. And take off. (The fly is hovering over the nest of an unsuspecting host bee and hurling eggs into its open burrow.)

How Fish React to Underwater Flash Lighting

The "Underwater Archive" maintained by Rollei-makers Franke & Heidecke in Braunschweig, West Germany, includes a catalog of how various types of fish react to photographic flash illumination. Swarms of herring become completely confused by flash lighting. Cod scatter after the first frightening blast of light, but curiosity eventually gets the better of them, and they return quickly to the location of the underwater photographer. Eels aren't disturbed at all by the photographer and his flash. This and other information are maintained by Franke & Heidecke as a service to photographers who own their Rolleimarin underwater housings for the Rolleiflex camera.

Journal of the Biological Photographic Association Vol. 27, No. 4 November, 1959

About Films and Emulsions in Phase Contrast Cinephotomicrography

ALEX L. BURTON, M.D.

Department of Histology & Embryology,
University of Montreal, Montreal (P.Q.)

FOR several decades, time lapse cinematography has been used in conjunction with the microscope; everyone knows of the excellent films produced by Commanden and de Frontbrunne of Institute Pasteur in Paris in the first years of this century; and the more recent ones by Warren H. Lewis at the Carnegie Institution of Washington.

The discovery of the phase contrast microscope has considerably stimulated the study of living tissues. Presently, time lapse phase contrast cinephotomicrography has become one of the most useful and efficient methods in biological research.

Investigators engaged in this field generally work with positive phase contrast optics and use reversal film in order to obtain positive images. In this way, details such as mitochondria inside the cytoplasm of a cell, for example, appear as small black dots and rods on a gray-white background.

Unfortunately, this method leads to a loss of contrast, since the reversal procedures necessitate a gamma of about 0.6 - 0.7. Moreover, in order to avoid halation and fog, most of the emulsions available on the market at the present time are coated on a blue or gray base; this replaces the former silver backing which was very difficult to remove during the bleaching procedure. This blue or gray base has a density of about 0.3 and also causes a loss of contrast since, while the human eye distinguishes a slight luminance difference in the low densities ranges, it is unable to appreciate the same difference in the higher densities levels.

Our problem was to overcome difficulties and more specifically to maintain and even increase the contrast of the image provided by the optics of the microscope.

Material and Methods

The most important part of our cinephotomicrographic work is the recording of living tissue cultures.

For this purpose, we use a Leitz Dialux microscope enclosed in an incubator where the temperature is thermostatically controlled and maintained at 37° C. The optical equipment consists of a set of Kinei negative high contrast phase objectives and a Kinei phase condenser, which have satisfactory optical properties.

Our pictures were taken with a model E Cine Kodak 16mm. camera, specially modified for our purposes, and are recorded either on Plus X negative type

This work is aided by a grant of The National Research Council of Canada.

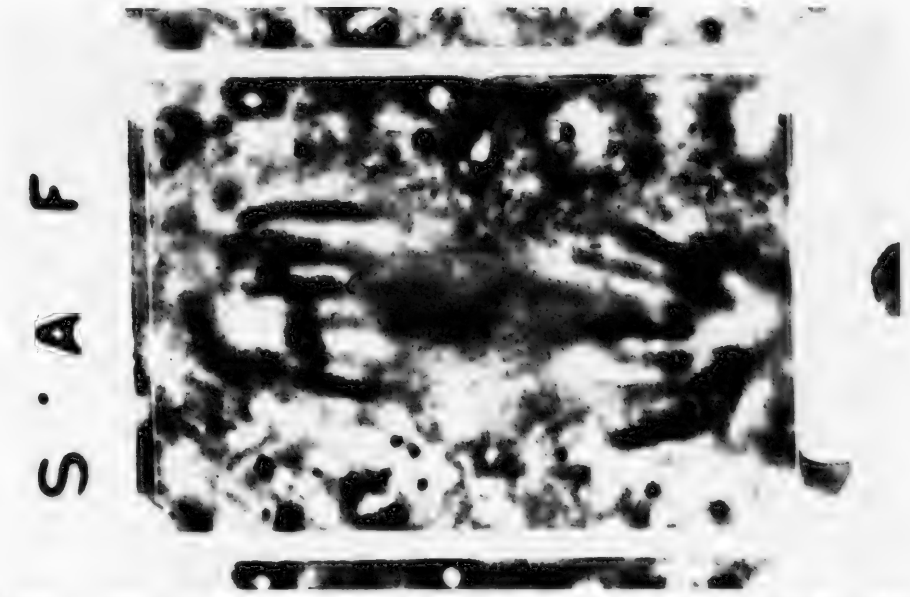


Figure 1. Direct enlargement of a 16mm. film frame. Anaphase during the mitosis of a Rat fibroblast. Magnification 750X. Negative phase. Negative picture on Plus X 7276 processed in DK50.

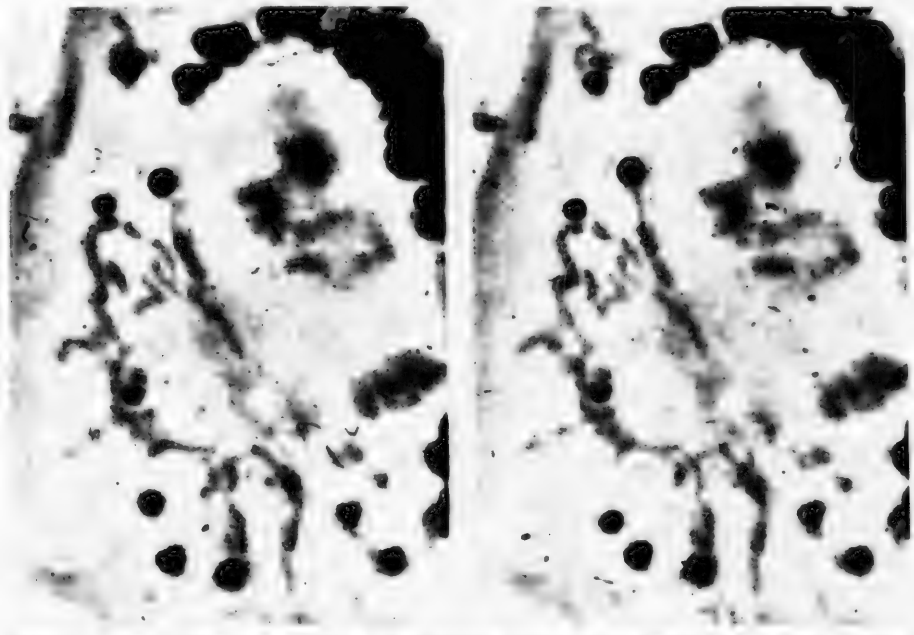


Figure 2. Two frames of a 16mm. film showing mitachondria beside the nucleus inside a fibroblast of Rat. Magnification 1200X (immersion objective). Other data same as figure 1.

7231, or on Plus X reversal film, type 7276. Using an old and well-known photographic trick, we underexpose slightly in order to get an increase in contrast. Both types of film are then processed as negatives, this procedure being necessarily simple, since our processing machine is a Morse model G3 machine.

The processing steps are as follows (data given for a 100-ft. roll):

1. Presoaking — After loading the machine, the film is carefully pre soaked in the following bath:
   Water ..... 2,000 ml.
   Formaline ..... 5 ml.
   Photo-Flo sol. ..... 2 ml.
   Time: 10 minutes at about 68 F. (20°C.).
2. Rinse — Wash in running tap water for 4 minutes.
3. Develop — Developers used are D11 for 18 minutes or DK50 for 20 minutes at 68°F.
4. Rinse — Same conditions as step 2.
5. Using the following bath:
   Water ..... 2,000 ml.
   Acetic acid 48% .... 100 ml.
   stop for 3 minutes. Rinsing, step 4, before this stop bath avoids spots and mottles which could be caused by an uneven action of the bath when used immediately after the developer.
6. Fix — Fixation is performed in any standard rapid fixer, such as Kodak rapid Liquid Fixer and Hardener, for about 4 minutes at 68° F., or twice the necessary time for clearing (this can be easily checked by a quick look on the film through the window of the machine).
7. Washing — 40 minutes in running tap water.
8. Washing in dist. water for 2 minutes, in order to avoid salts precipitates on the film.
9. Stabilize in the following bath:
   Dist. water ..... 2,000 ml.
   Photo-Flo solution 2 ml.
10. Dry.

Results

The best results were obtained by using Plux X reversal film, processed as negative in DK 50. In this way, the finest details are clearly visible, due to the increase in the contrast of the image without any enlargement of grain. In order to eliminate the density of the blue base, prints or duplicates can be made very easily on positive clear base stock in the standard way by the film laboratory.

Some examples of negative pictures directly enlarged from film strips are shown in figs. 1 and 2.

Journal of the Biological Photographic Association Vol. 27, No. 4 November, 1959

Simultaneous Projection of Serial Motion Pictures: A Method for Behavioral Studies in Psychopharmacology

JOHN R. WHITTIER

Creedmoor State Hospital and Institute for Psychobiologic Studies, Queens Village, N.Y.

SIMULTANEOUS presentation of serial still photographs to demonstrate change with time is the familiar "before-after" technique primarily employed in the fields of medicine and advertising. The method and advantages of the split-frame adaptation of this technique to cinematography have been described by Michaelis.[1] This author cites use of the method by Yule Bogue and Stanford (p. 273)*

This article describes an application of the method, permitting study of the effects of pharmaceuticals on the behavior of human subjects.

Method

Motion pictures are obtained of subject activity using standard motion picture apparatus and film. It is necessary that standardization be made of as many aspects of subject activity, scenes, and sequence as possible. Room, furniture, and lighting should be identical. Subject clothing should be similar if not identical. Sequence activity should be controlled. Subjects need not be observed during interview only, since differences appear in spontaneous behavior while alone which may be of significance, provided all other stimuli are identical during the scene sequence. Time of day and relation to meals should be the same.

If the sequence includes verbal interaction, as during psychological testing or interviews, attempt should be made to keep the content and timing of queries or instructions identical. It is not feasible, of course, to make simultaneous presentation of audio content of verbal interaction.

To permit comparison by simultaneous projection without the technical difficulty or editing cost of splitting the frame, two projectors are required. Running speed of each should be adjustable. It is convenient to show the initial film on the left of a screen and final film on the right. A single standard lantern slide giving dates, with the words "before"

*Michaelis also describes Gesell's great contributions to medical cinematography (pp. 242-243). It should be noted that these included split-frame technique similar to that described here, and termed "double or coincidental projection" by him (Yale Films of Child Development. "Growth of Infant Behavior: Early Stages", Arnold Gesell and Alice V. Kelliher, black and white, sound, 16 mm., available from Pennsylvania State University Audio-Visual Aids Library, University Park, Penn.)

and "after" in the lower left and right hand corners of the slide, projected beneath each of the two films, aids audience orientation. It is sometimes possible to project films taken in this manner in simultaneous and continuous sequence. However, manual interruption of one or the other projector usually is necessary to make good match of the activities content. Several runnings of the film will permit an operator to anticipate unmatched periods.

Discussion

The method described has been used to great advantage in demonstrating changes in behavior, or absence of change, during administration of 3 drugs to patients at this hospital. The drugs were 1) chlorpromazine, prescribed for agitated psychotic reactions in two aged patients shortly after the drug was introduced in this country in 1954, 2) aminophenylpyridone for Huntington's hyperkinesia in a single male patient, and 3) deanol in 6 female psychotic depressed patients. The method is especially effective when scenes are taken of behavior during placebo and following administration of the medication. In films of human behavior taken so far, stereotypy of certain characteristics of behavior under the standardized circumstances, including gait, gestures, mannerisms, and reaction to interviewer, was remarkable, quite apart from drug effects.

BIBLIOGRAPHY

1 Michaelis, A. R. "Research Films." Academic Press, New York, 1955.

New Photographic Museum to Rise in Munich

A photographic museum will soon be added to the many attractions of the West German city of Munich which is not only the capital of Bavaria but the largest photographic manufacturing center in Europe. (More than a score of photographic equipment makers are located there, including the Compur shutter works, the Rodenstock and Steinheil lens plants, and the camera, lens and electronic parts factory of Agfa.) The City Council of Munich is the founder of the new museum, and the largest element will be the personal collection of Dr. Rudolph Loher which includes more than 450 old camera models, 1,500 different lenses of historic interest, 200 different shutters, 200 binoculars, eye pieces, and accessories, and 4,000 books, catalogs and advertising pieces which trace the development of cameras and photographic accessories since their early beginnings.

Journal of the Biological Photographic Association Vol. 27, No. 4 November, 1959

Recording Fluorescence Phenomena Under Ultra-Violet Radiation*

D. A. GIBSON, A.I.B.P., F.R.P.S.

FLUORESCENCE is a phenomenon occurring when light energy is absorbed by a material and re-emitted at a longer wavelength. This will occur with any wavelength shorter than that which the substance will naturally emit as fluorescence. For example a material which will give off green fluorescence can be excited by both ultra-violet and blue light.

Because it will induce fluorescence at any longer wavelength, ultra-violet radiation would appear to be the obvious choice as a light source for fluorescence photography. However, there are some difficulties in its use: Fluorescence is always weak in intensity (Stokes's Law). Glass effectively filters out radiation below the 340 mu region. Ultra-violet of wavelengths shorter than about 300 mu are harmful to the human eye. For these reasons the best selection for most photographic work lies in using a light source between 350 and 400 mu. The high pressure mercury arcs, carbon arcs and photographic electronic flash lamps all have a high ultra-violet emission in this region.

The laboratory "Chromatolight" giving light in the 250 mu waveband is of relatively low intensity. A comparison between the exposure time necessary when using ASA.80 Ilford F.P.3. films to record the fluorescence excited by a 365 mu clinical "Fluorlamp" and a 250 mu laboratory "Chromatolight" would be 10 minutes and 90 minutes at f/8, with the lamp 12 inches from the subject.

Since glass stops ultra-violet radiation shorter than 340 mu, any lens system using these shorter wavelengths would have to be composed of quartz.

Using the longer wavelengths that will pass through glass ensures that no harm will come to the eyes of either the photographer or the patient

It is important to select the correct filter to place before the camera lens so as to pass the fluorescent light as freely as possible while stopping all the ultra violet radiation from reaching the film. The coating on many lenses is easily excited to fluorescence as is the dye in most photographic filters. Therefore one

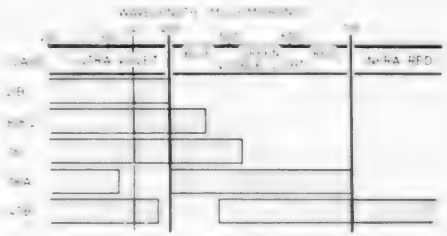


Figure 1

*Received for publication September 1959

should have ample data on the filter which should be placed before the camera lens.

In the table of Kodak Wratten filters (Fig. 1) the shaded portion indicates those wavelengths which are filtered out. The most useful filters for general work are numbers 2B and 8(K2). The 18A filter can be used over an incandescent light source to pass useful ultra-violet while removing all visible light. The 47B filter (tri-colour blue) has been included to show that this only passes blue light and cuts off sharply at the edge of the violet spectrum. The 16 filter has not yet been tried by the author, but it should be useful in removing the blue fluorescence emitted by many materials which is often so bright as to overpower any green or red fluorescence present.

The choice of film for monochrome records is restricted to the fairly fast panchromatic materials. Speed is of most importance; although grain size should not be larger than that which the subject will allow.

In the selection of a colour film the same is true. The high speed of Super Anscochrome has, until recently, made this film the almost certain choice. The recent announcement of Kodak's High Speed Ektochrome film offers another; on test this film would appear to have a higher resolution.

All colour films do not record fluorescence in equal degrees. Two examples are shown where ground sections of human teeth 6/1000 inch thick were transilluminated by light of 3200 K. and photographed by films balanced to light with this colour temperature. One was recorded on Ilford colour film and another on Kodak Ektachrome film. It will be seen that the Kodak film overemphasized the blue fluorescence of the dentine

Figure 2

(Fig. 2) whilst that photographed on Ilford film has an appearance very similar to that seen by the eye (Fig. 3).

Exposures using either monochrome or colour films are usually long, at least seconds and very often minutes or hours. When attempting to record fluores

cence of ringworm lesions in children, these long exposures were considered unacceptable. It was decided to experiment with a portable electronic flash unit as a light source. A Graphlex Stroboflash IV unit of 200 Joules output was used. An ultra-violet filter borrowed from a clinical "Flurolamp" was fitted before the flash lamp head, care being taken to ensure that no visible light was allowed to pass around the filter. This gave an encouraging result with the lamp 8 inches from the subject and using Super Anscochrome colour film. The camera lens aperture used was f/2.8. This did not allow a sufficient depth of field to record all the area photographed in sharp focus. Also the lens was being used at its maximum aperture which allowed little leeway should later lesions not show up so brightly.

Figure 3

Since the electronic flash equipment had its greatest ultra-violet emission in the longer wavelengths, it was decided that a filter might be obtained that would pass this radiation more freely than the filter from the "Flurolamp". Advice was requested from the Corning Glass Works, Corning, New York. Their filter number 7-54 was suggested. With this filter over the light source and a Wratten 2B filter before the camera lens it was considered that a minimum of the ultra-violet emitted was being wasted (Fig. 4).

It was decided to arrange the equipment placing a flashlamp on each side of the camera with the 200 Joules output divided between them and a 7-54 filter fixed before each (Fig. 5). Using two lamps in this manner would ensure that the light was spread evenly over the subject. A single lens reflex camera was chosen and the assembly was hand held with the flash lamps approximately 8 inches from the ringworm lesion. The room lights remained on during the exposures, this light being sufficient to focus

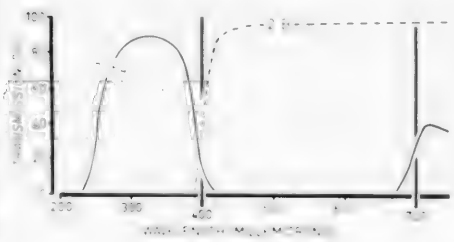


Figure 4

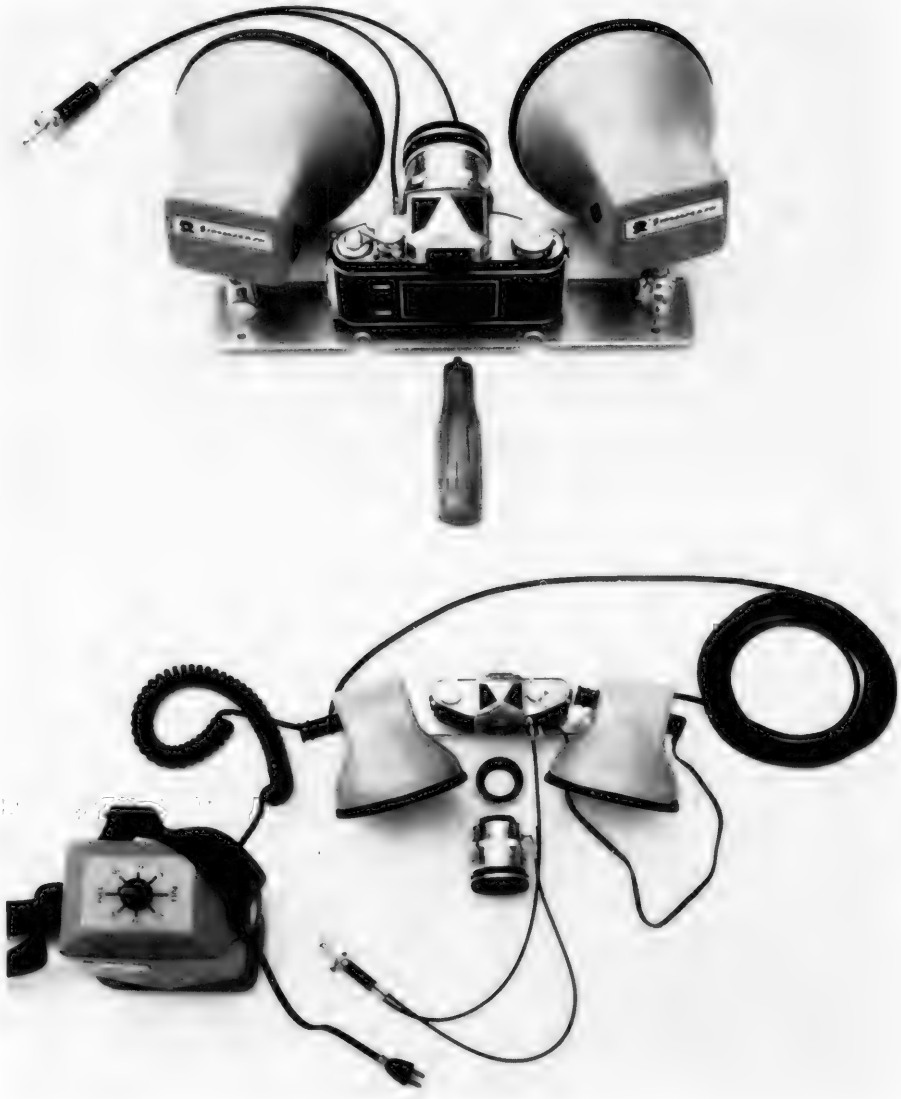


Figure 5

Figure 6

the camera by, but not having an ambient level high enough to record on the film. A lens aperture of f 5.6 was used using Super Anscochrome film. The resulting photograph showed a reasonable improvement over the earlier results for all the interesting area was in focus (Fig. 6).

These last results demonstrate the ringworm lesion, but the visual appearance was slightly greener than that shown in the color reproductions from which these illustrations were taken. It is possible that the technique might be taken a step further by using a Wratten 8 (K.2) filter in place of the 2.B, to remove a little of the excess blue fluorescence. This would of course, be at the expense of possibly one marked stop of the lens aperture.

ACKNOWLEDGEMENTS

I am grateful to Dr. A. Birt for allowing me to reproduce the photographs of his patients, and to Dr. W. Parker for checking the text of this paper.

REFERENCES

The Journal of Pathology and Bacteriology Vol LXX No. 1. "Florescence in Histology." J. D. Hicks and E. Matthaei.

The Kodak data book "Infrared and Ultraviolet Photography". Where many references will be found.

Journal of the Biological Photographic Association Vol. 27, No. 4 November, 1959

The Use of the Phase Contrast Microscope in Photographing Tissues Stained With Standard Stains

ANTHONY L. MARCHESE and K. KENNETH HISAOKA

Department of Biological Sciences,
Loyola University, Chicago, Illinois

THE phase contrast microscope has wide applications in biology. It is particularly useful in detailed studies of unstained cells and tissues. For example, phase microscopy can be used to advantage when photographing living teleost embryos (Hisaoka, Ott and Marchese, 1957; Hisaoka and Battle, 1958).

In investigating further, the use of phase contrast microscopy in photomicrography, we examined standard histology slides which were cut at 10 μ and stained with hematoxylin and eosin. A very old slide of the spleen (fig. 5) in which the stains had faded, showed very little details of structure when viewed with the bright field microscope. However, when the same slide was observed by means of the phase contrast microscope (fig. 6) the cells and fibers were seen with amazing clarity. Further examination of old, stained tissues which were sectioned at 10 μ, demonstrated the advantage of phase contrast microscopy over that of the bright field microscope. For example, the phase contrast microscope greatly improves the visibility of the chromatin content and cell membranes of spermatocytes (figs. 1 and 2). Also, reference to figures 3 and 4 will demonstrate the details of the nuclear membrane, chromatin, nucleoli and cytoplasm of the liver cells which were stained with hematoxylin and eosin. The advantage of phase microscopy when viewing plant tissues will also be evident if reference is made to figures 7 and 8.

Photomicrographs of either old or newly stained tissues which are prepared in the standard manner, can be improved by utilizing the phase contrast microscope.

REFERENCES

Hisaoka, K. K., J. N. Ott and A. N. Marchese 1957. Time lapse studies on the embryology of the zebra fish, *Brachydanio rerio*. Anat. Rec. *128*:565.

Hisaoka, K. K. and H. I. Battle 1958. The normal developmental stages of the zebrafish, *Brachydanio rerio* (Hamilton-Buchanan). J. Morph. *102*:311-327.

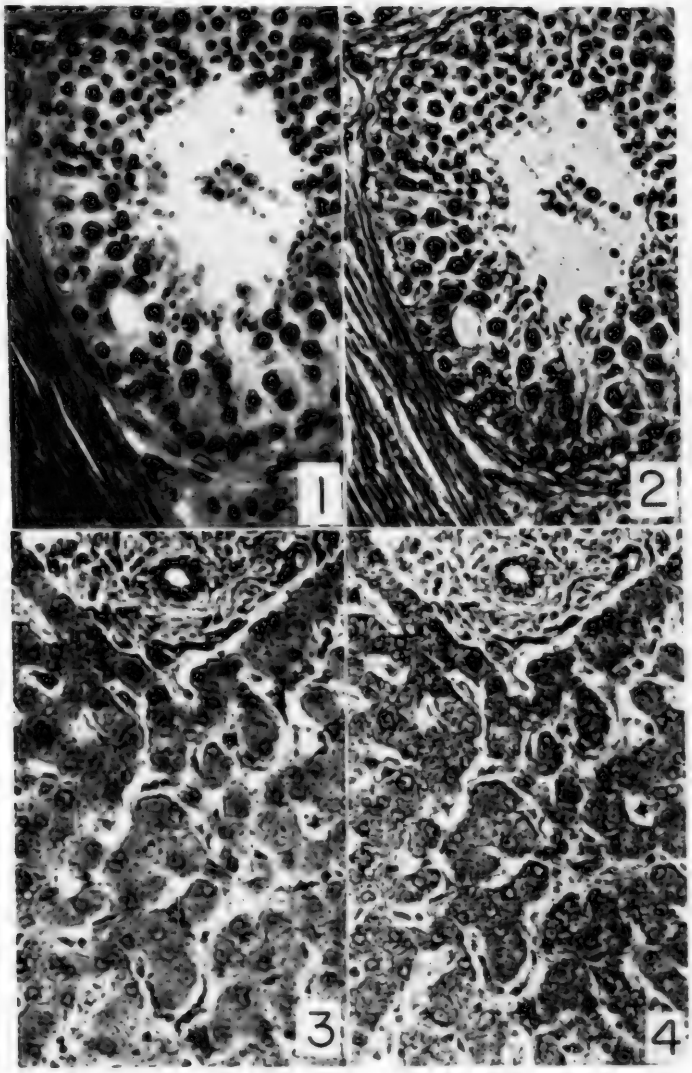


Figure 1. Photomicrograph of human testis (10 μ). (H. & E. stain. Bright field microscope used. X 315

Figure 2. Photomicrograph of human testis (same as shown in figure 1) using phase contrast microscope. X 315

Figure 3 Photomicrograph of mammalian liver (10 μ). (H. & E. stain. Bright field microscope used. X-315

Figure 4. Photomicrograph of mammalian liver (same area as shown in figure 1) using phase contrast microscopy. Note clarity of nuclear structure.

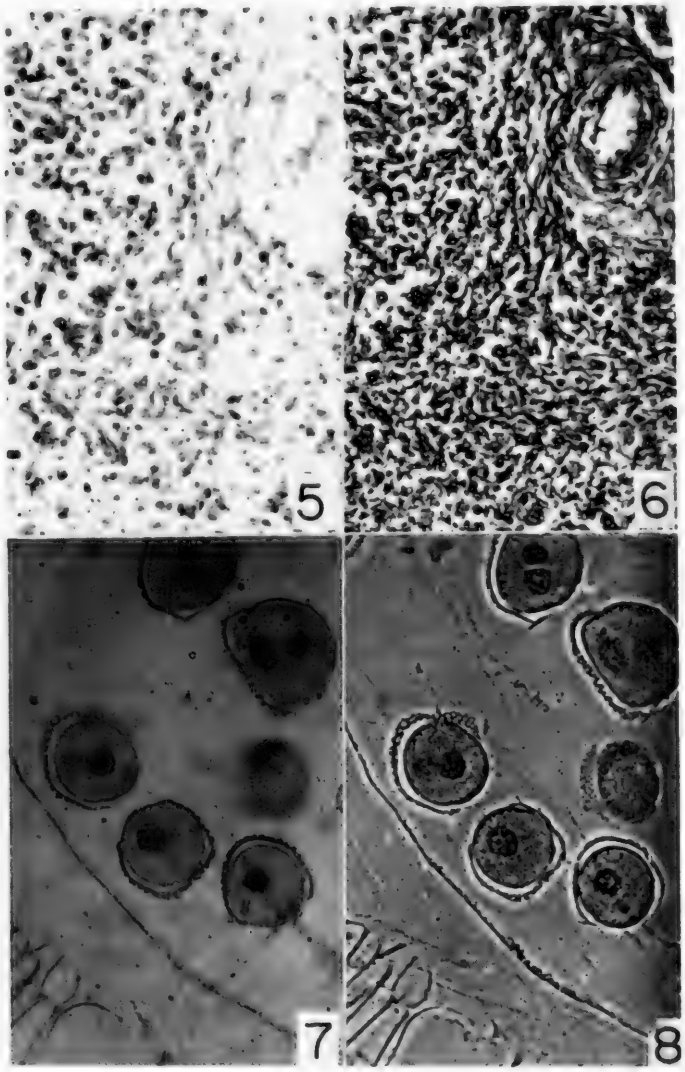


Figure 5. Photomicrograph of mammalian spleen (10 μ). (H. & E. stain.) Bright field microscope. This slide preparation was very old and the stains were faded. X-315

Figure 6. Photomicrograph of mammalian spleen. (H. & E. stain. Identical area as shown in figure 5. Phase contrast microscope. Notice the details of the cells and fibers. X 315

Figure 7. Lillium anther (10 μ) stained with orange G. Bright field microscope. X 315

Figure 8. Lillium anther stained with orange G. (Identical area shown in figure 7); Phase contrast microscope. X 315

All photographs were taken with Exakta camera.

AMA Awards for Photography

The American Medical Association at its 108th annual meeting in Atlantic City, New Jersey, June 8-12, 1959 made two awards for photography in the Scientific Exhibits.

A Certificate of Merit was awarded to Mr. William Atkinson, University of Miami, Miami, Florida. The photographs were color transparencies having excellent quality and consisting of photomicrographs and photographs of fungi in Petri dishes and of patients. The legends were black and white transparencies and were of appropriate size to be read easily from the usual viewing distance. The material was all trans illuminated and was mounted in cabinets of blond plywood. The entire exhibit had a very pleasing appearance. The title of the exhibit was "Systemic Treatment of Dermatomycoses With Griseofulvin" and was presented by Drs. Harvey Blank, Frank J. Roth, Jr., and J. Graham Smith, Jr. Incidentally this exhibit also received the Certificate of Merit for Dermatology.

Honorable Mention for Photography was awarded to Mr. Thomas J. Lannon, Cleveland Clinic, Cleveland, Ohio. His material consisted of very fine color transparencies of patients and photomicrographs. The headings were black and white transparencies with the main headings as negatives and the sub-headings as positives. The legends were simple and large enough to be read easily. The exhibit panels, behind glass, were light gray cardboard with openings for the transparencies. The entire effect was very pleasing to the eye. Mr. Lannon had equally good color transparencies in another exhibit but because of a greater variety of subject matter, the award was given to an exhibit entitled "Serotonin Sensitivity in Rheumatoid Arthritis and Related Diseases" by Drs. Arthur L. Scherbel and John W. Harrison.

The members of the judging committee (representing 120 years experience in photography) were Leonard A. Julin, Chairman, Ferdinand Harding and William J. Taylor. Nearly all of the photographs that appeared in the Scientific Exhibits were color transparencies or color prints. Some were of excellent quality but many of them were very inferior. An annoying feature of many exhibits was that the reading matter was much too small. They could not be read from a distance of several feet and it was very difficult to approach nearer because of the crowds. It was interesting to note that many favorable comments were made about one exhibit (not in competition) that contained black and white transparencies of patients. Indeed, in many instances good black and white transparencies can be more effective than color when color is not of importance

L.A.J.

Presentation of Award by Mr. Albert Levin

Mr. President, Ladies and Gentlemen:

The original concept of the Louis Schmidt Award was to acknowledge truly outstanding contributions to bio photography. In the past years the individual so honored have been workers whose main occupation was that of photography. This year, however, the man chosen is a physician. One who recognized the need to perfect a photographic tool in order to make his medical teaching effective.

The endoscope is an instrument used by doctors to probe the cavities of the human body. No one person has done as much to combine the recording ability of photographic film with the images produced by this instrument than the man we are honoring tonight, Dr. Paul Henry Holinger.

He received his B.S. from the University of Chicago in 1928, his M.D. from Northwestern University in 1933. He was made a diplomate of the American Board of Otolaryngology in 1936 and is at present Professor of Bronchoesophagology, University of Illinois, College of Medicine.

It was in 1941 in the Journal of the Biological Photographic Association that Dr. Holinger and his colleagues published their first paper dealing with endoscopic photography. From that date up to the present time, he has worked to produce an astonishing list of articles in the photographic and medical literature, and an even more impressive number of motion picture films and slides documenting the progress of endoscopic photography. A recent count shows twenty four published papers and twelve motion picture films. These papers and films have received world-wide distribution. For example, in 1947, at the International Film Festival in Brussels one of his films was awarded the first prize in the scientific film section. Many of you have seen his films at previous annual meetings and have read his articles in our Journal. He has been a BPA member since 1941 and in 1948 became a Fellow of the Association.

It is with great pride, therefore, that I hereby present Dr. Holinger with the 1959 Louis Schmidt Award of the BPA.

Remarks of Appreciation by Dr. Holinger

Mr. Levin, Mr. President, Fellow Members of the B.P.A.:

It is with deep appreciation of the honor you have accorded me that I accept the Louis Schmidt Award for 1959. I do wish to take a moment to thank you most sincerely and to express my thanks to the members of the B.P.A. who have made our work possible. Only because of their help have we been able to bring medical and photographic technics together. The preparation of the teaching materials has been a composite effort and I am more aware than anyone else of the part played in this work by so many members of the Chicago Chapter of this Association. I want to mention some of those who I feel share this award with me and to publicly acknowledge the help and direction they have given to our endeavors:

Joseph and James Brubaker whom I met first at a Chicago Chapter, B.P.A. Meeting. Their mastery of the technical aspects of optics, photography and instrument making will never cease to amaze me:

Dr. Garner and Dr. Nesselrod for their original work in this field of endoscopic photography:

Mrs. Maria Ikenberg who has always been helpfully critical and stimulating:

Mervin LaRue and Ralph Creer whose advice and help in the preparation of the teaching films has been invaluable:

Dr. Kenneth C. Johnston, my associate, who has helped in the actual photography of much of the clinical material: and my good wife who has had to put up with films in the dining room, the living room, the library, and sometimes the kitchen, since this is a hobby an avocation instead of a vocation!

So my deepest appreciation and thanks for being permitted to be a member of the B.P.A. and participate in its activities: and for this highest honor of the Association that you have given me.

First International Congress on Medical Photography and Cinematography, Cologne, 1960

The Medical Section of the Deutsche Gesellschaft für Photographie eV. (DGPh), Cologne/Germany, announces that- *contrary* to previous information the 1st International Congress on Medical Photography and Cinematography will take place September 27-30, 1960, in connection with the "photokina" (Sept. 24-Oct. 2) at Cologne.

Purpose of the congress will be to show the present status of photographic and cinematographic exposure and reproduction technique in medicine. Purely medical problems and complexes are not subject to discussion.

Deadline for the registration of lectures: March 15, 1960.

Deadline for personal registration: August 1, 1960.

Registration fees:

Until August 1, 1960 .....DM 30,..
After August 1, 1960 .....DM 40,..
Single day .....DM 10,..

The programme shall be available in May 1960.

On request, the office of the DGPh will be pleased to forward to you detailed information:

Deutsche Gesellschaft für Photographie eV. *Köln*, Newmarkt 49

Anglophoto Ltd
WILD

BOOK REVIEWS

ADVERTISING LAYOUT AND ART DIRECTION *by Stephen Baker.*

Clear, concise, step-by-step operation of an art director's skills as a draftsman, businessman, and artist, guide you from Chapter One to logical end in this fine book. This is a practical handbook showing the beginning of a concept, how to produce it, what the costs involved are, and how the concept follows the dictates of co-workers and client's viewpoint to get the final approval consumer approval. In addition to these sections concerning the work-a-day requirements of an art director, it also has material useful in guiding all artists to understand the organization and guidance of an art department.

Realistic in approach, unbiased in presentation, the communication of facts does away with much theory and presents a believable story. The best examples of this are sections dealing with the buying of art and how and when to use photography. These examples, as well as most of the others, are from actual published work of advertising agencies and completely removes some of the theory stigma from many phases of art. The concept of his work is comprehensive in its handling and can be a stimulant to the layout artist, photo-retouchers, and illustrators who may not be aware of the complexity of the truly well-organized art studio or agency, as well as to the student or apprentice who is willing to improve his knowledge and understanding of this fascinating field.

Raymond Mc Inerny

HANDBOOK OF CHEMICAL MICROSCOPY

by Emile Monnin Chamot and Clyde Walter Mason, 3rd edition, John Wiley & Sons, New York, 514 pages. 1958. $14.00.

The new edition of the handbook is considerably modernized with many footnote references to new papers, a new chapter on electron microscopy and particle size determinations have been expanded into a chapter. A colored plate is now included of the Michel-Levy scale of birefringence. Phase, interference, and fluorescence microscopy are briefly treated and new methods such as X-ray microscopy, profile microscopy are defined and key references included to modern work. Other footnotes call attention to new materials or sources.

The basic applications and use of polarized light microscopy and crystallography for chemical microscopy, comprise the main contribution of the volume. Brightfield and other methods are included in this edition which reflects the advances and needs of chemical microscopy for well trained microscopists. Mason is well known for stressing that the most important part of a microscopist is above the neck and the book carries on this useful view as well as the printed word can do. Microscopy is a profession and the new edition should further develop and add to the training of microscopists. The book should be available to all microscopists for study and reference. -O. W. Richards.

THE INTERFERENCE MICROSCOPE IN BIOLOGICAL RESEARCH *by Arthur J. Hale, E. & S. Livingstone, Edinburgh, and Williams & Wilkins, Baltimore, Md., 125 pages, 1958. $5.00.*

Interference microscopy reveals detail in specimens due to optical path differences that are too transparent for brightfield methods. The detail can be seen in color, or the actual path differences can be measured. The mass of small detail can be calculated from the path differences when the composition is reasonably homogeneous and known. These indirect weighings (correct within about ten percent) contribute to the basic data of quantitative biology.

Hale describes light and interference phenomena, multiple beam and two beam methods for microscopy. Fairly detailed directions are given for using the British Cooke-Dyson and Smith-Baker instruments, some suggestions for specimen preparation, and errors of the methods and their evaluation are discussed. The frontispiece shows in color the interference band system for tungsten light, and after seeing it there should be no

question as to what the orders are in interference colors. The technical description of wave form, interference, polarization, and examples of the calculations are considered briefly in an appendix. A small selected list of references and index are included.

Microscopists should read this book for an understanding of a new method and various kinds of instruments used. The book makes an excellent start but for the price charged, it should be more complete. O. W. Richards.

ALGAE/THE GRASS OF MANY WATERS *by Lewis Handford Tiffany, 2nd edition, Charles C. Thomas, Springfield, Illinois. 214 pages. 1958. $6.50.*

From slight pond scums to giant kelp sea weeds the algae are common plants. Many are microscopic and show intricate designs (diatoms). Others are extracted for chemicals such as agar. The sargasso sea has long intrigued mariners and biologists. Some algae are eaten by man and others may become part of his future food. These plants are described, how and where they live and their importance to man and other living organisms is discussed.

The small book is well printed on good paper and the illustrations include pen sketches, photomicrographs, specimen pictures and pictures of habitats. It is a good example of the possibilities for biological photography and should be of professional interest to biological photographers as well as not too technical interesting reading. The main difficulty comes from the long, proper names which need not be learned. With so many plants and animals one cannot have fifty different Johns, therefore other than common names must be used so that each organism has its own specific name. O.W.R.

Supersonic Lens Cleaning

When lenses are manufactured by traditional methods, antireflection surface coatings aren't applied until the individual elements have been dipped in chemical solvents and scrubbed by hand to the point where the surfaces are spotlessly clean. Most lens makers in West Germany now use a series of chemical baths to do the job, with two of the baths equipped with automatic supersonic agitators. Here, supersonic waves produce tiny bubbles in the chemical solution which strike the lens surfaces under high pressure at a vibration rate of 220,000 per second. The lens elements are transported from one bath to another in sieve-like baskets, after the pitch used in the final polishing operations has been removed by chemicals and manual friction. Although the supersonic equipment is relatively expensive, the cost is quickly liquidated by savings in wages and production time, and it pays off in unexcelled, uniform lens quality.

Association News

A section of the Journal devoted to official announcements, chapter events, and other matters of historical significance to the Association.

First Business Meeting

BIOLOGICAL PHOTOGRAPHIC ASSOCIATION, INC.

Sheraton-Mt. Royal Hotel, Montreal, Canada

AUGUST 31, 1959

Charles Hodge, General Chairman, welcomed members and guests to the 29th Annual Meeting of the Biological Photographic Association. An invitation was extended to all members attending a national Annual Meeting for the first time to be guests at the President's Reception Luncheon. Mr. Hodge then introduced Dr. Alexis F. Burton, University of [illegible] and Chairman of the St. Lawrence Valley Chapter. In the name of the members of the St. Lawrence Valley Chapter, Dr. Burton welcomed members and gave a brief historical review of the Chapter.

President's Report

Leo C. Massopust called the meeting to order at 10:20 A.M. This is the first time, he stated, that we have met outside the United States. This in itself is another milestone in the progress of the Association. Mr. Massopust emphasized the tremendous amount of work required for a meeting of this kind. In keeping with the reputation of the St. Lawrence Valley Chapter, he felt assured that it would be an outstanding meeting.

The President extended his thanks to Verlin Yamamoto, Vice President, for taking the load off his shoulders by coordinating committee activities. Mr. Massopust also thanked all the committee chairmen, and committee members, for making the Association [illegible].

Secretary's Report

The Secretary reported that our total membership on August 31, 1959 is 902, an increase of 138 over 1958.

Editor's Report

Mr. Massopust advised that the May 1959 Journal was in the mails and members would receive their copies when they returned from [illegible] which meant that the Journal was almost up to date. The Association still has the August number to publish, but the Editor was at work on this issue. It has been a problem bringing the Journal up to date because of the difficulties we had had for sometime. However, Mr. Massopust had not heard from any disgruntled authors. And the printer had been more than helpful. The Editor was in hope that when the Journal was caught up to date in publication that there would be some one who could take over the Editorship.

Tellers

Mr. Massopust appointed Messrs. Andrew Andreeko, Leonard Pimental and B[illegible] Johnson as Tellers. The slate of nominees was as follows:

President

[illegible]

Vice President

Mervin W. LaRue, Sr. (Voting for one)
Howard E. Tribo

Secretary

Jane Waters Cr[illegible]

Treasurer

Albert Levi

D[illegible]

Anthony M. Kuzma (Voting for two)
T[illegible] J. L[illegible]
James H. Rothenberger
J[illegible] N. Sc[illegible]
Leroy D. Winburne

Auditors

The President appointed the following Audit Committee: Sidney Shapiro, Barbara Turkington and John Kozio.

They were instructed to report at the Second Business Meeting.

Bids for 1963 and 1964 Annual Meetings

In behalf of the New York Chapter, Mr. Warren Sturgis extended an invitation to the Association and its members to meet in New

York City in 1964. He explained that earlier in the year the Chapter had planned to extend an invitation for 1965, but that in the meantime tentative plans had been made for a World's Fair in New York City in 1964. Both the Chapter and Mr. Sturgis felt that it would be a rather good thing for the BPA to hold its Annual Meeting during the time of the World's Fair because it would [illegible] larger crowd. Mr. Sturgis asked if another chapter would like to bid for the 1963 meeting. Since there were no bids extended, it was moved to table the question of the 1963 meeting until the Second Business Meeting. Seconded and carried.

Best Oral Paper Chairman

Mr. William Taylor was appointed Chairman by the President. Mr. Taylor will select two additional members.

Chapters Committee

Mr. Brown announced formation of the Southeast Chapter with headquarters in Charleston, South Carolina. He reported that for the first time the Association had a dissolution of a chapter, namely, the Houston Chapter. He reported that the Chapters Committee had been asked to continue the publication of the quarterly Interchapter Bulletin and increase the circulation to include every national member. In the past, the Bulletin [illegible] and the Board of Governors. Mr. Brown announced a meeting of chapter representatives or at least one member from each chapter, for 5:00 p.m.

Standards Committee

Mr. Batz reported that the Committee is working on three projects. One: to compile [illegible] Biological Photography. Two: to prepare a statement of Recommended Practices for a [illegible] securing and using photographic services, and in operating a photographic department. Three: the subject of certification.

As a first step toward certification, the Standards Committee recommended that an [illegible] should be prepared and made available to the BPA membership. The form should be drafted to provide full information as to experience, training, education, and recognition of performance, plus additional factual data the applicant may wish to submit. Standards for certification can then be drawn up in consideration of the information thus obtained.

This roster would be limited to those who [illegible] full complement of hospital or institutional photographic duties. If successful in this field, certification can later be established for other and specialized fields.

A Certification Board should be formed and should begin functioning as soon as applications for registration are submitted in sufficient [illegible] to indicate that there is extensive interest and belief in the value of certification. Fellows of the BPA who are full-time medical photographers should be requested to serve as the original Board of Certification.

The application form for the Roster of Medical Photographers should include the [illegible] for certification when standards of certification and a Certification Board have been [illegible]

There was considerable discussion from the floor after Mr. Batz' report. Mr. Massop asked for acceptance or rejection by the membership of Mr. Batz' proposal. Mr. Sturgis strongly urged the membership to [illegible] the report so we could at least get started. Mrs. Evelyn Palmer moved that we accept [illegible] of Mr. Batz. Seconded and carried.

Suggestions Committee

David Lubin, in reporting for the Committee, stated that they had compiled a list of suggestions received during the past two years. There were many good [illegible] many have been adopted, some have not been [illegible]. In the future, the membership will know more about what has been adopted when the Interchapter Bulletin [illegible]. Members of the Suggestions Committee are Howard I. Tribe, Chairman, and Messrs. Albert Le[illegible], Charles Lindsay, David Lubin and Lucien St. Laurent. Suggestions may be handed to any member of the Committee during the Annual Meeting [illegible].

Salt Lake City Meeting

Howard Tribe, General Chairman, reported the dates for this meeting are A[illegible] 26, 1960. The meeting will be held at the

Utah Motor Lodge, which is operated by the Hotel Utah. The lodge is 100% air conditioned, has a free swimming pool, is in the middle of the city, four miles from the airport, and two blocks from the rail depot. The facilities are the finest, and prices are moderate.

A get-acquainted party in the mountains with a regular barbecue is planned for the first night. The banquet will be held at the Hotel Utah. The Tabernacle Choir will give a special free concert after their rehearsal on Thursday night.

Adjourned 11:15 a.m.

Jane Waters Crouch, *Secretary*

Second Business Meeting

BIOLOGICAL PHOTOGRAPHIC ASSOCIATION, INC.

Sheraton-Mt. Royal Hotel, Montreal, Canada

SEPTEMBER 3, 1959

President called the meeting to order at 11:15 a.m.

Election of 1960 Officers and Directors

Fellers reported the election of the following candidates:

President	Verlin Y. Yamamoto
Vice President	Mervin W. LaRue, Sr.
Secretary	Jane Waters Crouch
Treasurer	Albert Levin
Directors	Thomas Lannon
	James Rothenberger

The President, after announcing the results of the election, introduced Messrs. LaRue, Lannon and Rothenberger to the membership.

Auditing of Treasurer's Books

Mr. Shapiro reported that the Audit Committee had found the Treasurer's books to be in order.

Bids for 1963 and 1964 Meetings

Miss Marjorie Jacobson, in behalf of the Western New York Chapter, extended an invitation to the Association and its members to hold the 1963 meeting in Buffalo, New York.

Mr. Yamamoto expressed the opinion that we should give thought to the fact that we would be having two meetings in roughly the same geographical location, if we accepted the invitation from the Western New York Chapter. That is, we would be meeting in Buffalo, New York in 1963 and in New York City in 1964. Also, he felt that there was the possibility that many members might forego the 1963 meeting in order to make their plans for attending the 1964 meeting in New York City, especially if there were the side attraction of a World's Fair. He suggested holding the bid for 1963 meeting open until chapters members could get back to their chapters and discuss holding the 1963 meeting in some other region.

Mr. Sturgis stated that the only reason the New York Chapter had bid for 1964, five years in advance, was the fact that if there were to be a World's Fair, the Chapter would have to commit the hotel well in advance. Richard Ray moved that there be a show of hands for holding the meeting in New York City in 1963 or 1964. The count showed the majority favored meeting in New York City in 1964.

Joseph Dant felt that there was a possibility the Southeastern Chapter could extend an invitation to hold the 1963 meeting in Augusta, Georgia. After it was moved, seconded and carried that the 1964 meeting be held in New York City, Mr. Dant moved that the Association hold the 1963 meeting in Augusta as guests of the Southeastern Chapter. Seconded and carried.

General

Mr. LaRue spoke a few words in behalf of the BPA Insurance Program. He stated that Mrs. Ikenberg would be happy to give interested members information on the program.

Mr. Sturgis moved that a rising vote of thanks be extended to the outgoing President, Mr. Massopust, who had served so excellently the past two years and who had accomplished the almost impossible task of bringing the Journal up to date.

A vote of thanks was extended to the St. Lawrence Valley Chapter.

Adjourned 11:40 a.m.

Jane Waters Crouch, *Secretary*

New Products

TWO NEW MANUALS PUBLISHED BY BRUBAKER: USE OF LENSES, AND ENDOSCOPIC TELESCOPE PHOTOGRAPHY

Joseph D. Brubaker, FBPA, Photographic

1. The Need for Basic Theory to Assemble

The various types of endoscopic telescopes and high intensity illumination methods are motion picture cameras having reflex focusing through the taking lens suitable for photography through endoscopic telescopes. New fast color films and other recent improvements have opened up new possibilities for photography through endoscopic telescopes.

"KEEMAG" t.m. Graphic Solutions in the Use

Graphic Solutions, Nomograms, Tables, and Capability

This universally applicable system can be used with any still, motion picture, or television camera, with lenses of any focal length

exposure calculation methods correct for

These [illegible] are useful with Close-Up, Gross-Specimen, Copying and Macro Cameras, and specialized forms of scientific and industrial photography where the Image/Object Size [illegible] is between [illegible] and 20X [illegible] through same size image, or up to 500 X size.

[illegible] gives rapid visualization [illegible] Focal Distances, Working Distance, Lens Focal-Length, Bellows Extension (and Ext. Tube Length), Field Size, and Exposure Control. These methods will aid any photographer to improvise apparatus for special uses, and [illegible]

All of the data is Keyed and Indexed by Magnification Number. (*KEEMAG Trade Mark). When written to two decimal places Magnification can be read as Per Cent Size by dropping the decimal point.

Focusing Scales [illegible] Size are furnished for use with any camera with [illegible] different focal-length scales; and master-scales [illegible] of any focal-length.

A Universal Depth-of-Field Table for [illegible] shows [illegible] for [illegible]

Field Size Charts [illegible] recommended area [illegible] use are included. [illegible] and Lantern-Slide Mask Data [illegible] able the photographer [illegible] charts, calculated in [illegible] size, for any camera [illegible] size.

A Proportional Scale Calculating Dial [illegible] the [illegible] [illegible] any [illegible] [illegible]

An entirely new **universal dial calculator** [illegible] **Exposure Computer for Magnification Change**, which sets either from standard

exposure meter reading data, or from standardized data of time and f-number known to be correct at a given magnification. The dial [illegible] new time or f-number needed to compensate for the change in magnification [illegible] per cent size (Change in bellows extension). [illegible] exposure [illegible] vision work with color photography.

The manual is 50 pages, 8½ x 11 inches, [illegible]

NEW KODAK EKTALITH METHOD TO PROVIDE SCHOOLS, HOSPITALS, CHURCHES WITH USEFUL COMMUNICATIONS TOOL

A new method of making inexpensive paper masters for offset reproduction of virtually any type of printed, typed, written or drawn original has been introduced by Eastman Kodak Company.

Designed for short press runs in roomlight office conditions, the Ektalith Method is expected to have special application in industry, [illegible] school and church administrators depend upon bulletins or other publications to keep staff [illegible]

The Ektalith method will make possible [illegible] checks, charts, and correspondence [illegible] minutes masters are produced photograph

The Kodak Ektalith Loader Processor, Model 1, is designed for use with conventional copying cameras like the one seen in the background. Thus, the system combines the speed and quality of optics with the low cost of paper masters for short offset runs. Above the operator is returning the paper holder and exposed Kodak Ektalith Transfer Paper, ready for processing in the activator. At right on table is accessory Kodak Ektalith Copy Unit for making direct copies by hand.

ically from virtually any type of original document, whether it is on opaque or translucent paper.

Using standard duplicating equipment, hundreds, often more than 2,000, copies can be produced, with the last as legible as the first. An accessory copying unit is available for making of high quality direct copies when no more than 10 copies are required. With a conventional microfilm enlarger, the Ekta-

Many halftones can be reproduced, and with the use of a contact screen, continuous- in be handled in many cases. Copy with both fineline detail and large solid areas is faithfully reproduced.

hanae. A moistened eraser or ink eradicator removes any excess notes or details. Last ruling sketches or typing before the master is readied for the duplicator.

heet of Kodak Ektalith Transfer Paper, processing it, and transferring the photo image to the paper master.

The Ektalith equipment line includes a loader-processor, two processors for use with darkroom cameras, and a copy unit which can be used with any of the three. All four pieces are for table top use. The loader- handles both 9 by 11 and 9 by 14 transfer paper and accommodates master sizes up to by 15 inches. List price of the Kodak Ektalith Loader Processor, Model 1, will be

able about January 1, 1960. They will be sold through Kodak Ektalith dealers, who are n w being established in major cities. For further information on sources of this equipment, or t the duplicating equipment required, contact the Graphic Reproduction Sales Division, Eastman Kodak Company, 343 State Street, Rochester 4, New York.

NEW MULTI-PURPOSE REAR VIEW PROJECTORS

Staples-Hoppmann, Inc. of Alexandria, Virginia, has come out with a new line of multi-purpose rear view projectors, the use of which is limited only by the ingenuity and imagination of the person making the presentation. These new rear projectors, which resemble large TV sets in appearance, combine the features of movie projection, still projection (slide or strip film), and a microphone. They are self-contained, movable, and can be viewed under normal lighting conditions.

Another feature of particular interest to the instructor or conference leader is a removable remote control panel (standard equipment

from which the entire presentation can be controlled. It gives the instructor or ence leader complete control over the presentation while allowing him to maintain personal eye contact with the audience. By merely pressing the buttons on this panel he can show a movie, switch to stills, go back to movie, use the movie sound, or replace it phone, without any break.

These new audio-visual aids come either a 25" x 34" screen or a 35" x 45" screen.

NEW WIDE ANGLE LENS ANNOUNCED BY GRAFLEX

quion lens adds super wide angle photogra phy to the versatile Super Grap Europe's finest lens craftsmen have produced the 65mm Super with Graflex's new Helical Focusing Mount and the Super Graphic Camera, it easily overcomes the obstacles brought about by subject area with normal lenses and the standard wide angle lenses.

The 65mm Super Anquion f/8 lens in the Graflex Focusing Mount will solve many problems in the fields of architectural, industrial

...banquet photography. For the first time those who use "22" or "23" roll film holders in their Super Graphics will be able to make ...

The ... Super Angulon ... manufactured by Joseph Schneider & Company, one ... lens manufacturers, along with the new Helical Focusing Mount, is being marketed by Graflex, Inc., a subsidiary of ... The ... element wide angle lens is manufactured to the highest possible standards. The

total angle of view of 100° is obtainable even at full aperture. It is mounted in a 65 Compur ... and to a 1 second plus B. The shutter is synchronized at all speeds for Class M and ... flash.

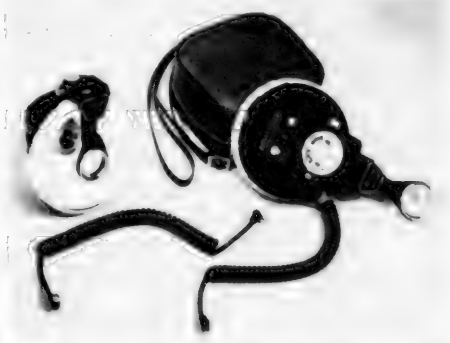
The focusing mount provides for precision focusing from infinity to 3'2".

The lens, complete with focusing mount and spacer plate to position the front standard, ready to fit to the Super Graphic, is available through Graflex Dealers. The lensboard as ... fits ... cameras. Owners of ... cameras can obtain the ... lenses at Graflex Service Departments.

Mounted on standard metal lensboards, the 65mm f/8 Super Angulon lens may be used on 4 x 5 Pacemaker Crown Graphic and Speed Graphic Cameras with equal success. For further information on the 65mm Super Angulon f/8 wide angle lens, the Graflex Focusing Mount, contact any Graflex Dealer ...

NEW ROLLEIFLASH 2

The popular bayonet mounted Rollei flash gun has been improved ... variable angle illumination and a ... folding bracket for easy packing. In addition ...



resulting in extremely high efficiency coupled with very even lighting. An automatic socket takes nearly all bulbs, including European glass types. A handy exposure calculator for ... number and for either reflector position is affixed to the back of the reflector. The BC circuit includes an open flash firing button and a test lamp. The Rolleiflash 2 is ... hearing aid type battery (not supplied). Provision, too, has been made for using external flash units. The gun comes in its own convenient plastic zipper case, for any Rollei bayonet size, and sells for $24.95.

SELF-CONTAINED ELECTRIC MOTOR DRIVEN CAMERA, A FIRST

The first self-contained electric motor driven camera, the Graphic 35 Electric, has been introduced by Graflex, Inc., a subsidiary of General Precision Equipment Corporation. Compact and cleanly styled, the Graphic 35

Electric presents a new concept in precision 35mm camera design and operation. A powerful electric motor, completely contained in the film take-up spool, winds the film, cocks the [illegible] sequence of single exposures. This feature represents an exclusive in that it is completely self-contained in the camera itself—in a body no larger than the average 35mm camera. No attachments, cords or power packs are necessary.

The precision electric motor is powered by two photoflash penlite batteries fitted into an insulated receptacle in the bottom of the camera. Exhaustive tests indicate that one set of batteries will provide approximately 1200 exposures. Nickel cadmium batteries will provide considerably more exposures. The electric motor switches off automatically after each exposure, and batteries can be exchanged at any time even with film in the camera.

In addition to the built-in electric operation feature the new camera offers exposure automation through unique coupling system, interlocked to the coupled range-viewfinder with parallax compensating bright frame finders with field indication for the normal, wide angle and telephoto lenses.

The most advanced Dynetic Compur shutter, with speeds from a full second to 1/500, [illegible] permits complete interchangeability of lenses, not just elements, of all focal lengths.

Normal, wide angle and telephoto lenses available for the Graphic 35 Electric include:

50mm 4-element f/2.8 Rodenstock Ysarex
35mm 4-element f/4.5 Steinheil Culmigon
135mm 5-element f/4 Rodenstock [illegible]

The camera, equipped with 5[illegible] retails for $237.50. Cost for the [illegible] with 50mm f/1.9 lens is $275.00. The 35mm f/4.5 wide angle lens is available for $[illegible] and the 135mm f/4 telephoto lens for $[illegible].

Further information on the Graflex Electric 35mm camera can be obtained by contacting your nearest Graflex dealer or by writing to Graflex, Inc., Dept. [illegible] Monroe Avenue, Rochester 3, New York.

STANDARD CAMERA CORP. INTRODUCES NEW WERRA 35 MM CAMERA

This is the WERRA, ultra-modern 35mm rangefinder camera being introduced by the Standard Camera Corporation, 319 Fifth Avenue, New York 16, N.Y. Standard [illegible] cameras in the WERRA line, retailing [illegible]

$49.50 to $79.50. All models feature two interchangeable [illegible] lenses, which advances film, winds shutter and [illegible] frame with one short twist of the lens housing [illegible] guard. In addition unique streamlined styling leaves the top of the camera body nearly perfectly clear.

The top model, WERRA IV, features [illegible] Jena Tessar lens, built-in exposure [illegible] shutter for speeds ranging [illegible] shutter, big bright combination viewfinder rangefinder window and lens interchangeability.

MEDICAL AND BIOLOGICAL ILLUSTRATION

CONTENTS

OCTOBER, 1959

Frontispiece.

Oddities of Medical Photography . . . . F. Ronchese

A Colourful Prospect . . . . . P. Hansell

Modern Processes of Colour Photography . . . . . R. J. Finn and J. H. Coote

Lighting in Orthopaedic Medicine . . . . R. Whitley

Improved Photography of the Larynx . . . H. Wieland

A Viewing-Box for Paper-Mounted Sections . . . . . N. H. Pierce and A. D. Morgan

Reconstruction-Modelling in Blotting-Paper . B. Towers

Equipment and Methods:

- Ronay Method of Colour-illuminated Display.
- K.I. Professional Tripod.
- Portable Sound-proof Booth.
- Super Anscochrome—16 mm. (Artificial Light).
- RCA-7404 Image Converter Tube.
- Kodak Coldlight Illuminator Series 2.
- Adhesive Centimetre Scales.
- Time Lapse Control Unit.

Abstracts.

Book Reviews.

Motion Pictures.

Reports and Proceedings.

Index to Volume IX.

Annual Subscription $10.00

Published Quarterly by the

BRITISH MEDICAL ASSOCIATION

Tavistock Square, London, England

SEND ORDERS TO MEDICAL MARKET RESEARCH LTD., 280 MADISON AVENUE, NEW YORK 16, N.Y.

CONTRIBUTING MEMBERS

Dean C. Altman
A. Andreeko
Anonymous
Dr. Spencer Atkinson
William Atkinson
Harold C. Baitz
Dr. Edgar C. Baker
E. Lynn Baldwin
Donald L. Bechard
Tibor Benedek, M.D.
Lester V. Bergman
Keturah D. Blakely
Leland Bowerman
Laurence B. Brown
Robert A. Brown
Charles G. Brownell
M. Bigelow Browning, M.D.
Joseph D. Brubaker
Dr. Ralph Buchsbaum
Perry Burgess, Jr.
William J. Cameron
Lardner Coffey
Philip A. Conrath
Howard Cradick
Joseph R. Dant
Capt. Stephen P. Dittmann
P. K. Duraiswami, M.D.
C. Graham Eddy
Edward Entin
Louis A. Facto
Dr. E. J. Farris
Jack Fason
Prof. Deam H. Ferris
Louis Paul Flory
A. Wilson Footer, M.D.
Jay T. Fox
H. Lou Gibson
Luther R. Gilliam

D. M. Glover, M.D.
Leo Goodman
F. W. Goro
Alex A. Gravesen
Avis Gregersen
Richard D. Grill
C. G. de Gutierrez-Mahoney, M.D.
Ferdinand R. Harding
Rudolph J. Henning
Leslie E. Hier
David Hilbrand
Constance Holland
Nathan S. Horton
Joseph T. Jackson
Homer Jones
M. George Jorgenson
Leonard A. Julin
Nathan C. Kantor
John Kozie
T. C. Kramer
Victor R. Landi
John M. Langton, M.D.
Thomas J. Lannon
Mervin W. LaRue, Sr.
Pierre J. LeDoux
Henry M. Lester
Albert Levin
K. Cramer Lewis
Gerald M. Lindley
David Lubin
James Mahaffey
Francis C. Mallory
Robert Mallory, III, M.D.
William L. M. Martinsen
Leo C. Massopust, Sr.
Thomas Masterson
Richard G. McClure
Leslie McWilliam
Dr. C. C. Mendenhall

Julius S. Mesiar
Bernard J. Moore, Jr.
Robert M. Moore, Jr.
Robert T. Morrison
Alex V. Mucha
Leonard Perskie
Dorothy M. Pinkham
Arthur Proetz, M.D.
Dr. William Quijano
Richard H. Ray
George W. Reis
Dr. Oscar W. Richards
Bernard Salb
Sidney Shapiro
Anne Shiras
Mrs. Elvira Showstark
Paul J. Showstark
Mose Smith, III, M.D.
William G. Smith, Jr.
H. E. Steadman, M.D.
M. Victor Stokes, II
Warren Sturgis
Joseph W. Tandatnick, M.D.
W. Jackson Taylor
William J. Taylor
Dr. Harvey E. Thorpe
Howard T. Toenniges
Howard E. Tribe
Harris B. Tuttle
Lloyd E. Varden
Dr. Roman Vishniac
Julius Weber
Allen Weinberg
Leonard Winograd
Lloyd A. Wolf
Thomas L. Wood
June Woodworth
Verlin Y. Yamamoto
Stella Zimmer

SUSTAINING MEMBERS

AGFA INCORPORATED
AMERICAN SPEEDLIGHT CORP.
ANSCO
ARKAY CORPORATION
CHARLES BESELER CO.
BRINKMANN INSTRUMENTS, INC.
E. I. du PONT de NEMOURS & CO.
EASTMAN KODAK CO.
ELGEET OPTICAL CO., INC.
EXAKTA CAMERA CO.
W. J. GERMAN, INC.
GRAFLEX, INC.
KARL HEITZ, INC.
KERN CO.
KLING PHOTO SUPPLY CORP.
POLAROID CORPORATION
POSTGRADUATE MEDICINE
J. G. SALTZMAN, INC.
SANDERS LABORATORIES, INC.
SIMMON BROS., INC.
S. O. S CINEMA SUPPLY CORP.
WILLOUGHBYS

FELLOWS of the ASSOCIATION

HAROLD C. BAITZ
JOHN J. BEITER
DR. ARTHUR D. BENSUSAN
PERCY W. BROOKS
LAURENCE B. BROWN
CHARLES G. BROWNELL
JOSEPH D. BRUBAKER
JOHN V. BUTTERFIELD
*JULIAN CARLILE, 5-4-59
LARDNER A. COFFEY
RALPH P. CREER
JANE WATERS CROUCH
J. W. CRUNELLE
CAPT. STEPHEN P. DITTMANN
S. C. DUNTON
C. GRAHAM EDDY
CHARLES E. ENGEL
DR. EDMOND J. FARRIS
LOUIS PAUL FLORY
JAY T. FOX
ARTHUR W. FUCHS
JAY M. GARNER, M.D.
H. LOU GIBSON
ALEX GRAVESEN
AVIS GREGERSEN
JULIUS HALSMAN
ALLEN HANCOCK
DR. PETER HANSELL
FERDINAND R. HARDING
CHARLES P. HODGE
PAUL H. HOLINGER, M.D.
*JOSEPH HOMAN, 3-17-59
NATHAN S. HORTON
MARIA IKENBERG
LEONARD A. JULIN
FRED W. KENT
THOMAS J. LANNON
MERVIN W. LaRUE
PIERRE J. LE DOUX
HENRY M. LESTER
ALBERT LEVIN
CHARLES LINDSAY
ROGER P. LOVELAND
DAVID LUBIN
ADOLPH MARFAING
WILLIAM L. M. MARTINSEN
LEO C. MASSOPUST, SR.
I. L. MATLOVSKY
JOHN A. MAURER
STANLEY J. McCOMB
JOSEPH E. MINEO
HENRY M. MORRIS
DR. ROBERT OLLERENSHAW
WILLIAM F. PAYNE
LEONARD L. PERSKIE
DR. ARTHUR W. PROETZ
CHESTER F. REATHER
DR. OSCAR W. RICHARDS
MAURICE N. RICHTER, M.D.
HENRY ROGER
DR. GEORGE L. ROYER
ROBERT A. SAGE
SIDNEY SHAPIRO
ANNE SHIRAS
WILLIAM STEVENSON
WARREN STURGIS
WILLIAM J. TAYLOR
HOWARD E. TRIBE
HARRIS B. TUTTLE
LLOYD E. VARDEN
ROMAN VISHNIAC
JULIUS WEBER
JOHN E. WITHEE
VERLIN Y. YAMAMOTO
H. WOLFGANG ZIELER
STELLA ZIMMER

*deceased.

FELLOWSHIP PROCEDURE

Members may propose for Fellowship in the BPA other members whom they consider worthy of recognition. To be eligible for Fellowship a candidate must have been a member of the Association for five consecutive years and must possess one or more of the following qualifications:

Superior craftsmanship in still or motion picture photography of biological subjects.

Ability in photographic research in new methods or materials.

(These require submission of evidence.)

Meritorious contributions to biological photography overall through sustained organizational work.

Two sponsors are required. The sponsors should be well acquainted with the candidate's work and ready to furnish the Board with details of his experience and achievements. Those who wish to sponsor a member whom they believe to be eligible should request a Fellowship Application form from the Secretary of the Fellowship Committee: Mrs. Maria Ikenberg, University of Illinois, 904 W. Adams Street, Chicago 7, Illinois.

CONTENTS

JOURNAL OF THE BIOLOGICAL PHOTOGRAPHIC ASSOCIATION

Volume 27, Number 4 — November, 1959

PHOTOGRAPHING PRECIPITATION BANDS IN AGAR GEL PLATES . . . . . Ross Jackson 133

PHOTOGRAPHING INSECTS CLOSE UP . W. P. Nye and G. E. Bohart 139

ABOUT FILMS AND EMULSIONS IN PHASE CONTRAST CINEPHOTOMICROGRAPHY . Alex L. Burton, M.D. 146

SIMULTANEOUS PROJECTION OF SERIAL MOTION PICTURES: A METHOD FOR BEHAVIORAL STUDIES IN PSYCHOPHARMACOLOGY . . . . . John R. Whittier 149

RECORDING FLUORESCENCE PHENOMENA UNDER ULTRA-VIOLET RADIATION . . . . . D. A. Gibson 151

THE USE OF THE PHASE CONTRAST MICROSCOPE IN PHOTOGRAPHING TISSUES STAINED WITH STANDARD STAINS Anthony L. Marchese and K. Kenneth Hisaoka 156

AMA AWARDS FOR PHOTOGRAPHY 159

PRESENTATION OF LOUIS SCHMIDT AWARD BY MR. ALBERT LEVIN . 160

REMARKS OF APPRECIATION BY DR. HOLINGER 161

FIRST INTERNATIONAL CONGRESS ON MEDICAL PHOTOGRAPHY AND CINEMATOGRAPHY, COLOGNE, 1960 . . 161

PICTURE STORY, 29TH ANNUAL MEETING 162

BOOK REVIEWS 164

ASSOCIATION NEWS 166

NEW PRODUCTS 169

MEDICAL AND BIOLOGICAL ILLUSTRATION 175

CONTRIBUTING MEMBERS 176

SUSTAINING MEMBERS, FELLOWS OF THE ASSOCIATION, FELLOWSHIP PROCEDURE . . . . . Inside Back Cover

PRINTING BY HAMMERSMITH-KORTMEYER COMPANY, MILWAUKEE, WISCONSIN